IRON TRADE REVIEW AND WESTERN MACHINIST

VOLUME XX. CLEVELAND, O., DECEMBER 15, 1887. NUMBER 51.

THE DAVEY SAFETY ENGINE.

Messrs. Chas. P. Willard & Co., 236 Randolph street, Chicago, who have been for the past three years manufacturing the Davey Safety Engine, have placed upon the market a new form of motor of one, two and four-horse power, especially designed for school houses, court houses, office buildings or private residences, where a system of low pressure steam heating is in use, for running machinery or circulating hot or cold air by means of a fan. This engine is an improvement on the Davey Motor, and like it, does not require any steam pressure, taking its steam supply from a radiator or the exhaust of a high pressure engine, or from any steam generator which will furnish steam at one pound pressure. Like the Davey, this motor is absolutely non-explosive, and safe, and possesses many new and preferable features. Full particulars may be had by application to the manufacturers, as above.

Must the Blue Print Go?

Mr. Frank Van Vleck presented an interesting paper at the recent Philadelphia meeting of the American Society of Mechanical Engineers, in which he directed attention to the fact that in the modern engineering works the blue-printing room has become almost as indispensable as the existence of the drafting department itself. This ferro-prussiate or blue print process has but gradually worked its way into this elevated position, yet its possibilities and its exactions have well-nigh revolutionized many of the old draughtsmen's methods. The requirements of the photo-engraving process, being nearly identical with those of the blue print, have also lent their aid in effecting this result. These changes have been the abandonment of all colors save black. All must be white or black, with no semi-tones permissible. It is true that a very few still use colors as washes on tracings, but this number is gradually decreasing as the result is almost always unsatisfactory, for the reason that colors so used give by transmitted light through the transparent tracing different results according to the difference in actinic effects of the colors, and this effect has no direct correspondence with the color used. As the blue print must of necessity be in monotone it is practically useless to seek for sectioned effects by the use of color on the tracing.

Considering the several facts in the case, Mr. Van Vleck suggested that it might be well for the society to stand as the sponsor for a system of sectioning which should be known throughout the country as the standard formally approved by them. A proposition to appoint a committee on the subject was, however, almost unanimously voted down.

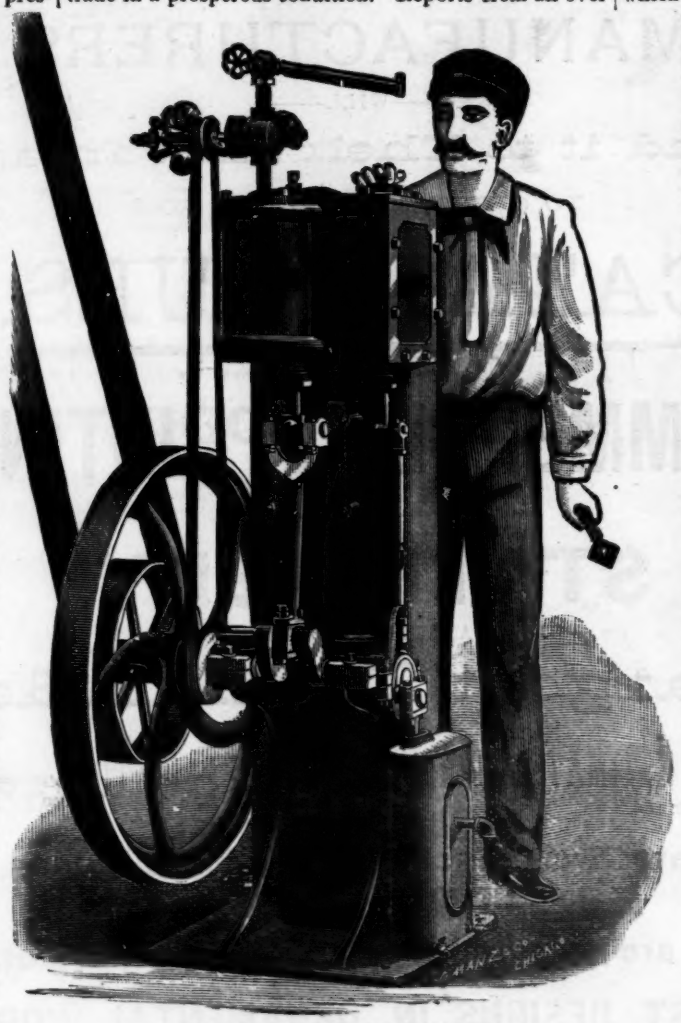
Internal Friction of Non-Condensing Engine.

At the recent Philadelphia meeting of the American Society of Mechanical Engineers, Prof. R. H. Thurston read a paper on the above subject, giving elaborate tables arrived at by numerous careful experiments. The conclusion arrived at by study of the results was that the internal friction of an engine of the kind tested, with a constant speed secured by the action of a throttling governor, is sensibly constant for all loads, and that the variations occurring at the points of connection in the train transmitting the work of the engine, when the power varies, form too small a proportion of the total friction to have important or sensible effect on the total, or to be observed in presence of other usual causes of irregularity. The conclusion reached by a comparison of the results of the present investigation with those which had preceded was that the internal friction of this class of engine (the non-condensing) is sensibly independent of the magnitude of the load and of the power developed, but that it is variable with speed and with efficiency of lubrication in a very observable degree. In the engine used in the latter tests the total friction was considerably less than in that employed in the earlier investigation, probably in consequence of its having been longer in service and its bearings having thus come to a better condition.

Manufacturing Prospects on the Pacific Coast.

Wood & Iron.

The year closing this month leaves every branch of trade in a prosperous condition. Reports from all over the Pacific Coast are very favorable. Our manufacturing industries never were in a better condition. Shops are all crowded with work, and order books show a fullness very gratifying to the proprietors. The demand for lumber is unprecedented; cargoes are arriving rapidly, and are as quickly disposed of. The southern portion of the State is alive and active, and the north is waking up. The year 1888 will come in with a business boom never before seen on this coast, and there is no reason why it should not continue. Good sound-headed business men predict that for the next five years the Pacific Coast will prosper as it never has before. So mote it be.



THE DAVEY SAFETY ENGINE.

A POUND of ten-penny cut nails will do as much work as two pounds of wire nails. Taking the average of all cut nails they are worth nearly double as much as wire nails, from tests made at the Watertown Government Arsenal.

STEEL NOTES.

Boston Herald.

A source of danger when steel is employed for bridges and other users in the presence of initial strains which may be in the metal to a serious extent. Annealing corrects this evil. The initial strains may result from inequality in cooling when the metal is in process of manufacture, or from shearing or punching of the metal, or from hammer blows on the cold metal. Punching and shearing are also injurious to iron, but perhaps not to the extent it is with steel. Steel exhibits this peculiarity, that when sheared or punched the scale in that vicinity starts off in lines, which extend out in the solid metal which seems to indicate that lines of strains sharply defined may penetrate the steel and not distribute themselves over much surface. May not these lines of strain reach sufficient intensity to cause that brittleness of fracture which at times occurs so unaccountably? Sharp corners should be avoided also nicks in the edges of steel bars.

A tough and fibrous metal when nicked around the outside will break short and brittle. Now suppose a nick was inside the bar, if it were possible to get one there, doubtless brittleness would result. A near approach to the interior nick is found in the case of a blow-hole in the steel which has not in the process of manufacture been flattened out in the direction of the line of pull; this causes brittleness in fracture, and as most steel rails are reported to fracture, when they do at all, in the first few months of their service, it is very probable that interior defects of this nature and initial strains are the causes. Certainly, if it were deterioration in quality from use, fractures would be more frequent instead of less as time elapsed.

Concerning the substitution of stone arches for iron bridges of moderate span it should be remembered that iron is the stronger material of the two, and except for the prodigal use of stone the structure would not possess advantages in point of strength. Practically there is no elastic limit to stone. It is beautifully elastic in the sense we referred to when speaking of the modulus of elasticity of iron and steel, having in this respect three to four times the elasticity of steel, but under maximum loads crumbles or flies apart; hence joints should be well made to bring much of the bed surfaces in contact, and where strength is required employ only the strongest cements.

Good-Bye to Bell Ropes.

An electrical contrive has been successfully tried on the Boston & Maine Railroad, which dispenses with the old fashioned bell rope for signalling the engineer. We understand that the Boston & Maine Company has made tests of several electrical devices, and has lately hit upon one which gave satisfaction. Two wires lead from a gong in the locomotive cab the whole length of the train, forming a continuous open circuit. By closing this circuit at any point in the train, the engineer's gong is made to ring. Ordinary push buttons in one end of each car serve to close the circuit, enabling signalling to be done from any part of the train. Really, this system seems to be practically the same as the open circuit system of electric bells used in nearly all offices, manufacturing establishments and hotels.—[Manufacturers' Gazette.

THE several iron and wire-working establishments in East St. Louis are working reduced forces as winter approaches. The change, however, is entirely seasonable and not at all significant.

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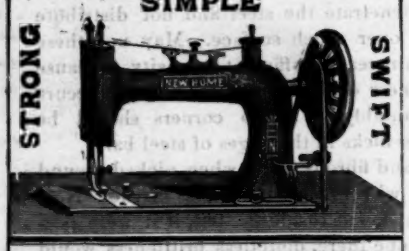
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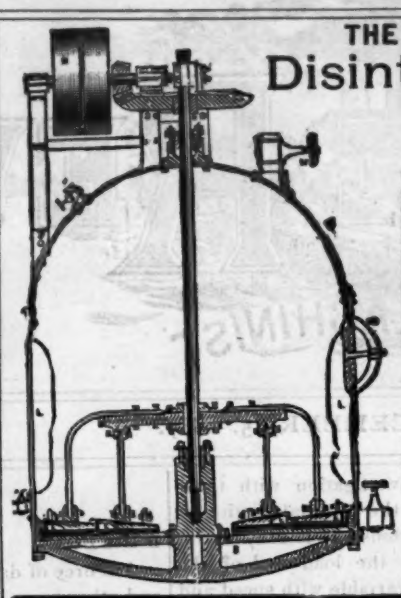
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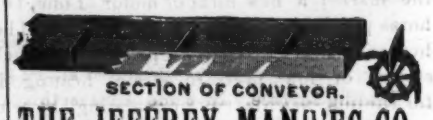
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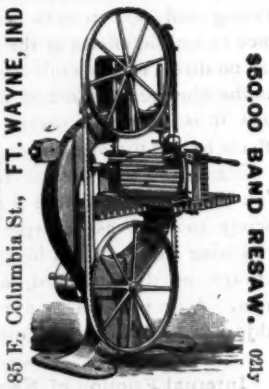
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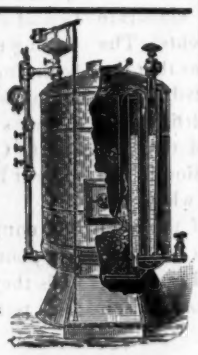

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HEATING SURFACE OF UPRIGHT TUBULAR BOILERS.

The usual method of reckoning the power of the ordinary form of upright tubular boiler seems to be to figure everything from the bottom of the water-leg to the top of the upper tube sheet in a lump, and call it effective heating surface. Sometimes a little more seems to be added to the amount thus obtained, for the purpose, evidently, of making the nominal power figure just right according to some standard.

That this method of computing the heating surface of this class of boilers is liable to lead to serious errors may be easily shown. That portion of the fire-box surface below the surface of the layer of fuel is of very little use for making steam. The fuel lies dead against these surfaces within a very short time after making the fire, and unless the fire is very skillfully handled there will soon be a non-conducting layer of ashes in contact with the sides of the furnace which will effectually prevent the transmission of heat to the water in the water-leg. It will be perfectly safe to omit the lower six inches or so of the fire-box in estimating the power of the boiler.

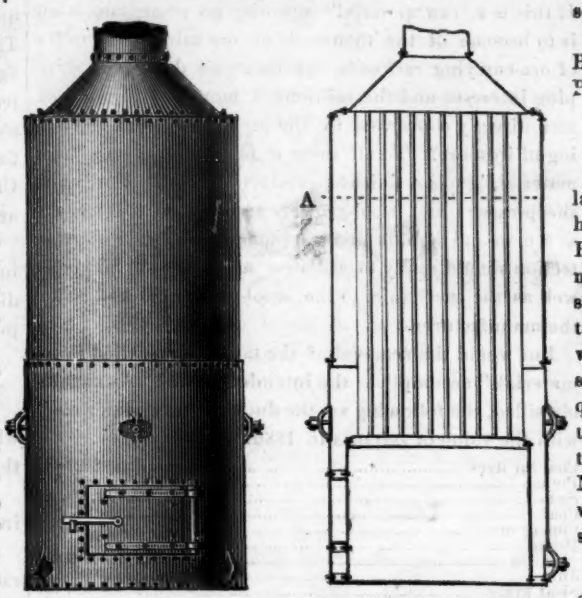
But the most serious source of error consists in estimating the portion of the tubes above the water-line as heating surface. In some boilers this forms about 35 per cent. of the total surface exposed to the fire, and it may easily be seen that great discrepancies may sometimes be found between the nominal power of a boiler where such surface is estimated and the actual power it may be enabled to develop.

For the sake of illustration, we have taken the amount of heating surface given in the catalogues of several makers of this kind of boiler, and compared it with the amounts obtained by figuring the same from the dimensions of the boilers as given by them in the same tables. In every case the amounts given exceed, in some cases, considerably, the figures we obtained by calculating the entire internal surfaces of the boiler, from the bottom of the mud-ring to the upper tube sheet, and when proper deduction is made for the useless portion of the upper ends of the tubes, the discrepancy in every case is found to be very great.

Of course it makes no difference in the actual power of a boiler whether this surface is estimated or not, the point we wish to call attention to it is the fact that in designing steam plants if the surface is figured this way, and no margin is allowed, the boiler power will generally be found, when the plant is started, much too small.

A single case will illustrate this point. A heating system was put into a large building, and it was thought that upright tubular boilers were the most available for the space allotted for boiler room. They were put in, the amount of heating surface being figured very close as is generally the case with such contracts where there are several competitors for the work. When the plant was started up it was found that holding steam was simply impossible; a calculation of the heating surface (actual) of the boilers showed it was just sufficient to maintain steam in the supply and return pipes of the system (which owing to the peculiar arrangement necessary, were very numerous and of large size) and in cold weather this was all that could be done. Every expedient was resorted to that could be thought of, but all to no purpose whatever, until more boiler power was added, when everything worked as smoothly as could be wished.

In our illustration, which represents a 36-inch boiler drawn to a scale of about three eighths of an inch per foot, the water line would be at the point marked A. It will easily be seen that the tube surface above this line comprises about 25 per cent. of the entire heating surface in the boiler, and it cannot make steam, for there is no water in contact with it to make steam of.—[The Locomotive.



HEATING SURFACE OF UPRIGHT TUBULAR BOILERS.

NINE international expositions are to be held in two years. Hamburg, Barcelona, Copenhagen, Glasgow, Brussels, Melbourne, Munich, St. Petersburg and Clarkoff are the selected cities.

STEEL RAILWAY SLEEPER.

Several particular features distinguish the Hoerde steel sleeper, shown in the accompanying illustration, from those of other systems. The inclination of 1 in 20 required for the rails is produced direct in the process of rolling, while at the same time additional strength and durability are imparted by increased thickness of metal at the inclined portion, as compared with other points. The middle part of the sleeper is made considerably narrower than usual, but is increased in depth, as shown in the illustration, so that the base toward the center is diminished.

Those parts most liable to strain and wear are strengthened by being made extra thick, while the other portions may be reduced in thickness without detriment to the efficiency of the sleeper. Owing to this judicious distribution of material, by which the metal is placed where it is most required, a sleeper is produced of 10 per cent. less weight, as compared with one of the ordinary pattern of uniform section, while at the same time possessing equal strength with the latter. The increased depth of the middle of the Hoerde sleeper offers greater resistance to bending than where the depth is uniform, so that any considerable deflection and widening at the gauge become almost impossible even with imperfect ballasting. To demonstrate this a series of comparative tests were made between a Hoerde and a standard sleeper, both being of similar weight and being of the pattern used on the Dutch railways. They were each supported at the center and loaded at the rails. The tests commenced with a load of 6,062 lb., the increase of gauge being 0·18 in. for the Hoerde and 0·37 in. for the other. With 7,275 lb. the standard sleeper failed, the gauge spreading 1·18 in. and a permanent set of 5·19 in. being left. The Hoerde sleeper had its load increased in five stages up to 12,125 lb., by which time the increase of gauge had risen to 0·38 in., of which 0·08 in. was permanent, and a permanent deflection of 0·16 in. had been set up. In short, the Hoerde sleeper bore 12,125 lb. without injury, while the standard sleeper failed completely with 7,275 lb. Another advantage, arising out of the contraction of the middle portion of the sleeper consists in a greater resistance to creeping and in the impossibility of any ballast spreading toward the middle. This prominent defect in laying down a line is at once got rid of by the new form. The workman is, in fact, compelled to pack the ballast only where it is required, under the rails. There are thus two separate spaces for ballast formed, which prevent the latter from being forced by the traffic toward the center.

The cost of the Hoerde sleeper per ton is about the same as that of the ordinary pattern, while the saving effected in weight gives the former a decided advantage. The Hoerde sleeper is being used in considerable quantities on the following railroads: Dutch State railways; German State railways, Magdeburg, Rhine Railway (right bank), Altona, Frankfort-on-the-Main, Erfurt; military railway at Schoneberg, near Berlin; Imperial lines in Alsace and Lorraine; Pfalz railways; and on several lines in France and Belgium.

It is being manufactured in Germany by the Hoerder Bergwerks und Huetten Vereine, Hoerde-Rhenish, Prussia.—[Engineering.

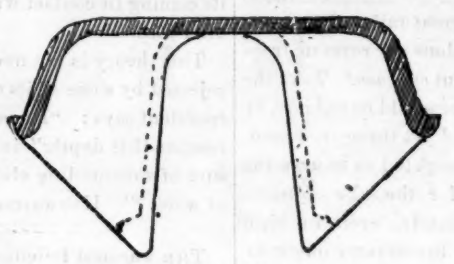


FIG. 3.—SECTION A. B.

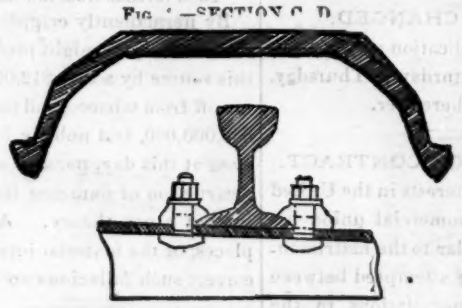
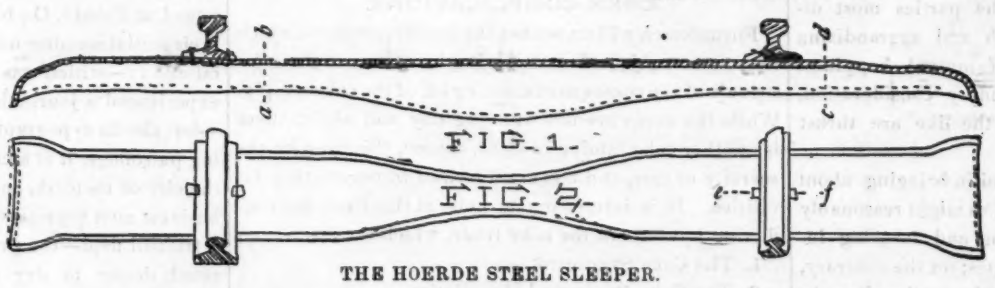


FIG. 5.—SECTION E. F.



THE HOERDE STEEL SLEEPER.

QUERIES AND ANSWERS.

MAGNETIZED WATER TANKS.—Two water tanks burst lately in this place [Fulton, N. Y.]. One was 150 feet high, 30 feet diameter, shell ⅜ inch thick steel, I suppose Bessemer. The Fulton water tank is of iron, but is magnetized. I went to chipping on it and the chips stuck to it. I could not blow them off but had to knock them off. I want to know if being magnetized they would become crystalized, and whether it would affect steel more than iron, thus causing their bursting. It is quite common here to hitch the telephone ground wires to the water pipes. Whether this has magnetized the tank I don't know, or whether it is the current of water. Now I have tried to explain as well as I could what I want to know. I hope in your excellent paper to see something about this. H. SKINNER.

Heavy Casting for Forth Bridge Works.

Glasgow Engineer.

Messrs. Thomas Aimers & Sons, engineers and moulders, Galashiels, have been turning out some heavy castings for the Forth Bridge works, ranging from seven to thirteen tons. One of the latter weight was successfully run into the mould on Saturday last, and is now almost ready for forwarding to the Forth Bridge. It is what is termed a cress block, to be used in bending the large steel plate of which the great tubes and strutts are formed. The cress blocks are fixed into a great hydraulic press at the works, having a pressure equal to 1,200 tons, and are concave and convex. The steel plates to be operated upon are 14 feet in length, 4 feet 3 inches in width, and 1¼ inch thick. The plates are placed in a furnace and heated to blood red heat, when they are taken out and placed in the hydraulic press between the cress blocks, and then the necessary pressure is applied. Eight of these plates fastened together form a section of the strutt or tube.

The Heating Power of Fuel.

The heating power of fuel is ascertained by the following process, which consists in burning one gramme of the coal or fuel in a small platinum crucible, supported on the bowl of a tobacco pipe and covered by an inverted glass test tube, through which is passed a stream of oxygen, while the whole is placed under water in a glass vessel. The oxygen is fed into the test tube by a movable copper tube, which may be pushed into the test tube so as to come immediately over the crucible. The coals burn away in a few minutes with very intense heat, and the hot gases escape through the water, the bubbles being broken up by passing through sheets of wire gauze which stretch between the test tube and the walls of the vessel containing the water in which it is placed. The temperature of the water is taken before and after the experiment, and from the figures thus obtained the heating power of the coal is calculated.—[Ex.

IT would take 1000 windmills to furnish power enough to drive a modern rail-mill.

IRON TRADE REVIEW
WESTERN MACHINIST

A JOURNAL OF THE

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CLEVELAND, O., DECEMBER 15, 1887.

BUSINESS CHANGE.

The publishing and printing business formerly conducted by Day & Carter has been transferred to a stock company, known as the Cleveland Printing and Publishing Company, of which the following are the officers: President, W. M. Day; Secretary, F. N. Carter; Treasurer, F. J. Staral; Superintendent, A. Wintemberg. The offices of the new company remain in the Lithograph Building, corner St. Clair and Wood streets, Cleveland, but are now on first floor, entrance on St. Clair street. Correspondents, patrons and exchanges will kindly take notice.

DAY OF PUBLICATION CHANGED.

With this issue the day of publication of the IRON TRADE REVIEW is changed from Saturday to Thursday, and this arrangement will continue hereafter.

AN UNDESIRABLE MARRIAGE CONTRACT.

The efforts of certain importing interests in the United States and Canada to bring about commercial union between the two countries is very similar to the matrimonial arrangements that were frequently attempted between royal households in Europe. The negotiations in the first instance do not proceed from the parties most directly interested but from the selfish and aggrandizing papas and mammas. Questions of mutual happiness and welfare are remanded to secondary consideration, and titles, marriage settlements and the like are thrust to the front as all-important.

Similarly, the parties now engaged in bringing about a union of the two countries are not, as might reasonably be expected, the great manufacturing and laboring interests of Canada and the United States; on the contrary, these two great interests, which would most be directly and immediately affected by the change, are almost a unit against the scheme. But no, the selfish aggrandizement of the importers must be considered above everything else and a state of affairs brought about which no dispassionate man can contemplate with unconcern.

It has been repeatedly pointed out that the main question at issue is not affected in the least by the fact that the two countries are separated by imaginary lines instead of by wide-reaching oceans. Every argument that can be urged for commercial union with Canada can be applied with equal force in urging commercial union with Great Britain. The same reasons for protection against the competition of British manufacturers and workmen in England are valid as against the competition of British manufacturers and workmen in Canada.

The adoption of any such unwise and uncalled for scheme would cripple the great iron ore industry of the Lake Superior country; would bring Canadian wheat in direct competition with the product of the American farmer; would, in short, benefit a few non-producers at the expense of the great body of producers in both countries. We do not believe that any considerable number of people on either side desire this change—certainly not on this side.

THE FALLACY OF ADMITTING RAW MATERIALS.

One of the recommendations of President Cleveland's annual message is that the tariff on "raw materials" be removed. The question naturally arises, What constitutes "raw materials?" Coal? In the earth, yes; but on board the car it has a new value, and that value means the labor put upon it in mining and loading. Surely to the mining interests it is not "raw material." Iron ore? If this is a "raw material" needing no protection, what is to become of the thousands of ore miners, the miles of ore-carrying railroads, the immense docks, the shipping interests, and the millions of money and armies of men directly concerned in the production and marketing of iron ore? To all these it is very far from a "raw material;" it is a finished product. Wool? Verily the sheep-raisers and wool-growers of the West will rise up as a man and dispute this inference. The rule of protection should apply to all labor alike—to the miner as well as the mechanic, to the wool-grower as well as to the manufacturer.

But would the removal of the tariff on so-called "raw materials" accomplish the intended result? As usually classified, the following are the dutiable "raw materials," with the value of imports in 1886:

Coal tar dyes	$522,686
Potash	104,716
Soda	1,448,263
Coal	581,000
Copper ore	108,096
Hemp	194,136
Manilla	626,895
Jute	393,788
Sisal grass	493,751
Hay	184,351
Hops	217,917
Iron ore	525,193
Marble	224,672
Salt	706,324
Lumber	867,849
Zinc	88,900
Wool	5,126,108
Total revenue from raw materials	$12,419,645

By permanently crippling our great railroad and vessel interests, we might probably reduce our revenue from this source by about $12,000,000, but *cui bono?* Take the tax off from tobacco, and the revenue would be reduced by $30,000,000, and nobody hurt. And yet there are found, even at this day, persons so short-sighted as to urge the destruction of immense interests for the sake of carrying out a pet theory. A little study, even in high places, of the material interests of the country ought to correct such fallacious opinions.

COKE COMPLICATIONS.

Furnacemen will remember the inconvenience to which they were subjected last Spring by reason of the coke strike and the consequent shutting off of the coke supply. While the ovens are now running day and night, there is another coke famine in sight, caused, this time, by the scarcity of cars, and a general lack of transportation facilities. It is interesting to note, at this time, the conflicting interests in the coke trade, which are:—

1. The Coke Syndicate.
2. The Coke Producers' Association.
3. The independent coke producers.
4. The railways.

To explain the situation, it may be well to say that the coke syndicate produces nearly three-fourths of all the coke made, but by an agreement with the Coke Producers' Association is enabled to control the output of the association also. In return, the syndicate, having by reason of its preponderance of business the greatest "pull" with the railways, is pledged to furnish the Producers' Association with cars in proportion to its output. It appears that the members of the Producers' Association experience great difficulty at present in securing cars and, until recently, they accepted in good faith the statement of the railway managers that the scarcity of cars is general, owing to the unprecedentedly large freight movement throughout the country. Latterly, however, the Producers' Association has made an important discovery. It is said that the syndicate members have no trouble whatever in getting cars, while the Producers' Association gets none. In other words, it is charged that the syndicate is about to gobble up the entire coke business, its obligation to keep the Producers' Association supplied with cars notwithstanding.

In their dilemma the members of the Producers' Association, together with the leading independent producers, met last week and resolved upon a union for the purpose of finding a way to market regardless of the syndicate arrangement. Statistics were produced that appeared to wipe out the excuses offered by the railways, and which would seem to warrant action to be taken by the inter-state commission on the ground of discrimination in favor of the syndicate.

The November coke shipments were not quite 24,000 cars, against 25,725 for October and 28,000 for September. The present shipments fall short of the actual requirements of Western furnaces alone by some 150 cars. The syndicate ovens, it is said, cannot supply this shortage but rather than give up the number of cars guaranteed the Producers' Association, permits furnaces to run short of coke. The Chicago furnaces are safe because of their individual cars run directly from Connellsville to Chicago as special trains, but many intermediate points are in need of coke.

The Producers' Association has placed its pool contract in the hands of an attorney, to proceed against the syndicate for failure to supply the association with its proportionate number of cars.

ORIGIN OF NATURAL GAS.

A correspondent sends us the following notes from which, he explains, a possible explanation of the formation of natural gas might be elaborated:

1st. A temperature of about 960° F. will convert water into oxygen and hydrogen gases.

2d. The temperature of the earth increases at the rate of one degree F. to every fifty feet downward from the surface.

3d. At a depth of less than ten miles the temperature will be sufficiently thigh to decompose water.

4th. The difference in composition of natural gas (from that of decomposed water) may be accounted for its coming in contact with a variety of different elements after formation.

This theory is not new but is still held by many though rejected by some of its old-time adherents. Our correspondent says: "It may be difficult to show that water reaches that depth;" and he adds: "Would the pressure of surrounding elements prevent the decomposition of water?" Has anyone any explanation to offer?

THE warmest felicitations are due, and are hereby extended, to the editor and proprietors of the *Business World*, a handsome 32-page semi-monthly journal just issued at Toledo, O., for the splendid showing made in their initial number now before us. Not only in editorial ability—which was naturally to be expected from so experienced a journalist as Mr. J. B. Battelle, the editor—but also in typographical finish and generous advertising patronage, it is a credit alike to its originators, to the city of its birth, and to the liberal and progressive business men represented in its columns. It has chosen a fruitful field—the promotion of the interests of "the retail dealer in dry goods, groceries, boots and shoes, hardware and general merchandise in the middle western and northwestern states" and the extension of "the business of wholesale dealers and manufacturers," and it will no doubt achieve a shining success.

WE imagine the manufacturers of Wheeling and vicinity, who have so liberally aided in the establishment of a new trade paper, the *Ohio Valley Manufacturer*, feel a keen pride in their enterprise. Certainly they have just reason to indulge in a little exultation; for the *Manufacturer* is well edited, well printed, well arranged, and well patronized. May it thrive and prosper.

THE Youngstown (O.) Industrial Exchange has just closed the first year of its existence and can point with just pride to several tangible accomplishments during the last twelve months, in the line of building up the industrial interests of the city. Dr. J. F. Wilson is the efficient secretary.

PETROLEUM FUEL BY A NEW PROCESS.

About two months ago we had occasion to refer to a new fuel plant in use at the Topliff carriage bow works, on East Prospect street, Cleveland. The plant had then been in operation a few days only and was not shown to advantage, Since then, the various parts have been regulated and to-day there can be no doubt that in the oil gas made by their process, the inventors, Messrs. Bury & Bidelman, have found a fuel in every way preferable to either coal or coke. On Thursday of last week the works were visited by a party of business men and manufacturers, including the Committee on Fuel Gas of the Board of Industry, Mayor Babcock, City Civil Engineer Rice, Chief Engineer of the Waterworks Whitelaw (who by the way, is at the head of the Civil Engineers' Club of Cleveland) and several others interested in the subject.

There was no special test or exhibition. The men were kept at their usual work and the visitors investigated at their will, without being chaperoned. In a little brick addition were found two tanks, each 16 feet long, 28 inches wide and 22 inches deep, placed horizontally, one above the other. These tanks are divided into a number of compartments so that the dividing walls raised up from the bottom reach to within two inches of the top, alternating with walls that descend from the top to within two inches of the bottom. Oil, either crude or distillate, is charged into each compartment to the depth of about six inches, the remaining space being filled with charcoal. The latter soon becomes thoroughly saturated and in that condition contains a large quantity of oil and oily substances.

The two tanks, or generators, are connected. An ordinary air pump forces air into the first compartment of the upper generator at a pressure of about nine pounds to the square inch. The air is forced into the second compartment containing, first, the oil-saturated charcoal and, on the bottom, the oil itself. Thence it is forced from one chamber into the next, the construction of the compartment walls producing a current that may be likened to the wave motion. Thus, alternately, passing through charcoal and oil, the air in its progress becomes impregnated with the volatile elements of the oil, the charcoal assisting in arresting too rapid motion as well as giving to the gas additional fuel power in the way of carbon. After traveling the length of both generators, the air, now transformed into gas, is stored in a tank and is then ready for immediate use, either for fuel or illuminating purposes.

With an ordinary gas burner a flame of great brilliancy is produced. The feed is steady and no flickering of any kind is perceptible. With an argand burner the result is excellent. But the best qualities of the gas are shown in three heating furnaces where, with the aid of a cold blast, an enormous heat is produced. For the purposes of comparison the furnaces fed with gas are so conveniently arranged that the difference between the gas and the coke furnaces becomes apparent at once. The gas furnaces turn out better work, and more of it. The heat is continuous and no stops are required to charge up with fuel. It is cleaner to handle, heats the iron more quickly and is a great saving in price. The coke fuel for the nine furnaces averaged $10 a day. Of these nine, three are now being run with gas made out of about 70 gallons of crude oil, two barrels of which, delivered at the works, cost $1.10. The saving, therefore, in the cost of fuel alone, is between sixty and seventy per cent.

There is no reason why the entire works could not be run one day with the gas made from five barrels of crude oil. This would mean an expenditure of about $2.75 for heating nine furnaces and lighting up the shop and offices, as against $10 for the furnace supply alone. These are the figures of the firm using both the coke and gas. The gas has been in use now some two months and it will be introduced at once throughout the shop. These results are of too much importance to manufacturers to be lightly passed over. It will not do, in these times of narrow profit margins, to overlook an invention which, properly and more fully worked out, means an immense reduction in the price of fuel for all manufacturing purposes. If in its experimental stage this process is a success, what may be expected of it in the future?

Mr. Bidelman, the inventor, is Superintendent of the Petroleum Light & Heat Co., of Adrian, Mich. He says that he has repeatedly demonstrated the entire facility of making gas from oil at the ratio of 1,000 feet from one gallon of crude Ohio distillate, and of making, by the cold process, 20,000 feet of gas from one barrel of crude oil. If the generators are heated to 70° Fahrenheit, fully 30,000 feet of gas can be made, and have repeatedly been made, from one barrel of crude oil. For factories and shops and, eventually for domestic use, this invention is of incalculable value. The gas is about to be analyzed and tested as to its calorific properties in the laboratory of Michigan University, and the result will be watched with interest.

We are informed by Mr. Theodore Bury, the agent for the State of Ohio, that steps will be taken forthwith to ascertain the precise calorific properties of the oil gas, with a view to enabling a comparison to be made with coal, as to the steam-generating property of the gas, and the comparative cost.

CONCERNING CHIMNEYS.

The Locomotive.

A well-proportioned chimney, of neat design, from 200 to 300 feet high, is always an imposing structure and an ornament to a large manufacturing establishment, but it may well be questioned if it is ever worth while to build them over 150 feet high. Were cost is no consideration there is no objection to building them as high as one pleases; and sometimes the location, or the nature of the business carried on, or both combined, may make an extremely high chimney a necessity; but for the purely utilitarian purpose of steam-making we have yet to find a case where it was necessary to build a chimney more than 150 feet high; and in many cases where this height has been reached equally good results might have been attained with a shorter chimney at not much more than one-half the cost.

We do not wish anyone to understand from the above that we are making an argument in favor of very short chimneys, for we believe that many, in fact, more than one half the chimneys in use at the present time are too short. The point we would call attention to, is the fact that, after a certain height has been attained—enough to ensure sufficient intensity of draught, if the chimney is of proper sectional area—to burn any sort of fuel, the economical limit of height has been reached, and any additional amount of chimney power is obtained at a much less cost by keeping the height at this point and using a large chimney, than it can by increasing the height.

For example, a chimney is needed for a large battery of boilers. After much consulation and guessing it is decided that a chimney with a flue ten feet in diameter and 250 feet high will be about right, and it is built. This is perfectly satisfactorily, but it should be borne in mind that exactly the same results would have been attained at not over two-thirds the cost by making the flue just sixteen inches larger, or eleven feet four inches diameter, and 100 feet shorter, or 150 feet high. Ordinarily, this would represent a clear saving of about 5,000 dollars. This saving in first cost results from the saving of bricks and labor where the height is kept down with reasonable limits.

We are aware that many engineers like to make the height of the chimney about twenty-five times the diameter of the flue. This makes a neatly-proportioned stack; but, with all due respect to looks, we would suggest that "looks" are not what chimneys are built for; their primary object is to furnish draught to burn coal or other fuel as it should be burned. If a ratio of height to diameter of twenty-five to one is adhered to, then the smaller sizes of chimneys, for one or two boilers, will not be high enough to produce sufficient draught force, and chimneys for a large battery of boilers will be higher than will be at all necessary; and, as we stated above, their cost will be from thirty to fifty per cent. greater than it should be.

After a sufficient height has been reached to produce draught of sufficient intensity to burn fine, hard coal provided the area of the chimney is large enough, there seems no good mechanical reason for adding further to the height, whatever the size of the chimney required Sufficient draught will be furnished to be obtained if the area of the chimney is equal to the combined area of the tubes—where tubular boilers are used—and the height is 100 feet. With this height the area of the chimney may also be made equal to one-eighth of the grate surface, that being about the ratio existing between tube area and grate area when boilers are well proportioned. A much less height than 100 feet cannot be recommended for a boiler chimney for the reasons above given; the lower grades of fuel cannot be burned as they should be with a shorter chimney.

Thus we see, if the rule of making the height twenty-five times the diameter were followed with a 24-inch flue, our chimney would be but 50 feet high. This is not high enough to properly burn anything but the very softest fuel. And if the same rule is adhered to where a ten or twelve-foot flue is required, the height will be from 250 to 300 feet, much greater than is at all necessary for proper combustion of the fuel.

The idea obtains to a considerable extent among those unacquainted with the principles upon which chimney draught depends, that the draught power of chimneys increases directly as their height; so that, if we have two chimneys of the same size, but one being twice as high as the other, the higher chimney will have twice the power of the shorter one, or, in other words, will give sufficient draught, under the same conditions, for twice as many boilers as the other. This is an error. The increase of power would be, theoretically, but 41 per cent. more, and in practice, owing to the fact that the frictional resistance of the sides of the flue to the passage of the gases would be doubled, it would be less than 41 per cent. Given two chimneys having flues of the same size, but different heights, their power to burn coal under similar batteries of boilers would be in proportion to the square roots of their heights; so if one was to have double the power of the other it would have to be four times as high.

AS TO EMERY WHEELS.

At the meeting of the Polytechnic Section of the American Institute, held December 8th, L. Duvinage, in a paper, of which this is an abstract, said that the increased quantity and quality of work that goes out of the modern machine shop was due to the skillful use of solid emery wheels. He said that a grain of sand from the common grindstone, magnified, would look like a cobble stone, a fracture of which shows an obtuse angle, whereas a grain of corundum or emery would look like a rhomboid, always breaking with a square or concave fracture. No matter how much it is worn down in use it does not lose its sharpness; hence it is evident that the grindstone rubs or grinds and heats the work brought in contact with it, while the corundum or emery wheel with its sharp angular grit cuts like a file or circular saw.

There are two general classes of emery wheels in the market—one class of wheels has the grains of emery joined and consolidated by a pitchy material as rubber, linseed oil, shellac, etc. These must run at a high speed to burn out the cementing material by friction, loosening the worn out grains and thus revealing new cutting angles. These are non-porous wheels. Truing up this class of wheels is done with a diamond tool.

The other class consists of two kinds, one made by mixing the emery with a mineral cement and water into a paste, which will harden and bind the grains together; the other kind by mixing the emery with a mineral flux or clay, moulding into shape and burning in a muffle at a high temperature. These are porous wheels in which the grains of emery are held together by matter having affinity therefor. This class of wheels, unlike the grindstone, has sharp grains of emery bedded together among matter which, in some cases, is as hard and sharp as the emery itself. Such wheels cut very greedily, and do not need to be run at any particular speed.

The dresser, made of hardened steel picks is the proper tool for truing up this class of wheels.

Manufacturers in metal goods aiming at reducing the cost of production would do well to look into the adaptability of the solid emery wheels or rotary file and other labor-saving machinery before deciding on reducing wages of labor.

THE IRON TRADE REVIEW, which has displayed marked enterprise and ability in its devotion to the iron interests of its section will be published hereafter by a stock company, the leading stockholders and officers being the same gentlemen who have so successfully conducted the REVIEW in its past prosperous career. Ample capital has been provided and a bright future would seem to be in store for our Cleveland contemporary.—[Progressive Age, Philadelphia.

Thunderbolts Free.

It is interesting to note that whatever the duty on iron may be, Secretary Fairchild holds that thunderbolts may come into the country free. The electric light folks cannot be made to pay duty on their electricity, because it has no merchantable substance. Gas in a pipe is dutiable.—[Washington Star.

Kuhlow's German Trade Review for November 16th says of the German wire-rod industry: "In the rolled iron trade orders for abroad are scarce, and the export prices have declined considerably. On the home market there is a fairly good demand for iron and steel wire and prices are firmly maintained."

FOR EVERY DAY USE IN THE ENGINE ROOM.

The average weight of anthracite coal is 9.35 pounds per cubic foot.

Coke (loose) weighs 23 to 32 pounds per cubic foot.

Bituminous coal weighs, per heaped bushel, loose, 75 pounds; one ton occupies 48 cubic feet.

Cast iron weighs per cubic inch, 7.604 pounds; in round numbers, one-fourth of a pound to the cubic inch.

Green sand castings are 6 per cent. stronger than dry sand castings.

Cast iron will expand and contract between the extreme ranges of temperature in this country with a force equal to 4½ tons per square inch of surface exposed.

Wrought iron expands and contracts between extreme ranges of temperature equal to nine to one per square inch of section.

One gallon, U. S. standard, contains 231 cubic inches, weight of water in same, 8.331; one cubic foot contains 7.4805 gallons of water.

The velocity of steam, of atmospheric pressure, flowing into a vacuum is 1,660 feet per second; into air 650 feet per second.

To find the pressure in square inches of a column of water, multiply the height of the column in feet by 434.

The proper safe working load for wire rope is as follows: One-half inch in diameter, 1,000 pounds; five-eighths inch, 1,500 pounds; three-fourths inch, 3,500 pounds; 1 inch, 6,000 pounds. This is for 19 wires to the strand, hemp centers.

To find the diameter when the circumference is known, multiply the circumference by .3183.

To find the area of a triangle, multiply the base by one-half of the height.

No. 1 wire gauge sheet iron weighs 12½ pounds per square foot; No. 2 iron, 12 pounds; No. 3 iron, 11 pounds; No. 4 iron, 10 pounds; No. 5 iron, 9 pounds; No. 6 iron, 8½ pounds; No. 7 iron, 7½ pounds; No. 8 iron, 7 pounds.

To find the lap required on a slide valve to cut off steam at three-fourths stroke, multiply the stroke of the valve in inches by .250; the product is the lap in terms of the stroke. To cut off at two-thirds stroke, multiply by .289.—[Journal of Progress.

A SOUTHERN PAPER ON TARIFF TINKERING.

Baltimore Manufacturers' Record.

The message of President Cleveland will undoubtedly attract more attention than is usually accorded to such documents. It brings the tariff question to the front at once as the most important matter now before the public, but we regret to say that it advocates a policy the carrying out of which would prove of incalculable injury to the South. Under the influence of that protection which has built up the East, the South is developing as never before and is steadily increasing in prosperity. Her mines of iron ore and coal are furnishing profitable employment to thousands of workmen, her forests of timber are enhancing in value, and her manufacturing industries based upon these materials are assuming gigantic proportions. That the people of the South will be willing to see this wonderful growth checked, and the value of their ore, coal and timber interests largely destroyed by putting these articles on the free list, we cannot believe. Party allegiance, we know, has a strong hold, and justly so, upon Southern people, but we believe that if the fight is forced on this line, self-preservation will lose to the Democratic party several Southern States. The South, just entering upon what promises to be the most brilliant era of industrial progress that the world has ever seen, cannot afford to turn its back upon this growing prosperity simply that it may cling to the traditions of the past.

It behooves the people of the South who do not care to see their prosperity destroyed by free trade to make themselves heard at once. The danger confronts them, and no time is to be lost.

How Iron Breaks.

Stationary Engineer.

Hundreds of existing railway bridges which carry twenty trains a day with perfect safety would break down quickly with under twenty trains per hour, writes a British civil engineer. This fact was forced on my attention nearly twenty years ago by the fracture of a number of iron girders of ordinary strength under a five-minute train service. Similarly, when in New York last year, I noticed, in the case of some hundreds of girders on the elevated railway, that the alternate thrust and pull on the central diagonals from trains passing every two or three minutes had developed a weakness which necessitated the bars being replaced by stronger ones, after a very short service. Somewhat the same thing had to be done recently with a bridge over the river Trent, but the train service being small the life of the bars was measured by years instead of months. If ships were always among great waves the number going to the bottom would be largely increased. It appears natural enough to every one that a piece even of the toughest wire should be quickly broken if bent backward and forward to a sharp angle; but perhaps only to locomotive and marine engineers does it appear equally natural that the same results would follow in time if the bending so small as to be quite imperceptible to the eye. A locomotive crank axle bends but one eighty-fourth of an inch, a straight driving-axle a still smaller amount, under the heaviest bending stresses to which they are subject, and yet their life is limited. During the year 1883 one iron axle broke in running, and one in fifteen was renewed in consequence of defects. Taking iron and steel axles together the number then in use on the railways of the United Kingdom was 14,847, and of these 911 required renewal during the year. Similarly, during the past three years, no less than 228 ocean steamers were disabled by broken shafts, the average safe life of which is said to be about three or four years. Experience has proved that a very moderate stress, alternating from tension to compression, if repeated about 100,000,000 times, will cause a fracture as surely as bending to an angle only ten times.

LUBRICATION WITHOUT OIL.

Several interesting facts in regard to cylinder lubrication were brought out at the recent meeting of the American Society of Mechanical Engineers, at Philadelphia. Among other things Mr. Denton stated as his opinion that the friction of an engine was independent of the lead, and, among other things, presented the subjoined interesting table:

Indicated H. P.	Friction, H. P	Kind of engine.
84	7	Westinghouse, 12x11 inches, 300 revolut's
Unloaded	10	
23	5	Buckeye, 7x14 inches, 80 revolutions.
Unloaded	5 1	
347	44	Compound condens'g, throttled.
185	40	
181	19	Compound condensing, expansio .
137	25	

This table, it will be observed, shows that the friction is actually less in all cases but one when the load is greatest. Mr. Denton thought that the friction of a piston in a cylinder was slight, and that lubrication did not bring about any noticeable result so far as this particular part was concerned. In support of these statements he cited first the case of an engine in which the steam of the same pressure was admitted to both cylinder ends at the same time. The difference in area between the two faces of the piston, owing to the presence of the piston-rod, and the consequently greater effective pressure on the back, as compared with the front face, caused the piston to move slowly to the front end of the cylinder. The friction, therefore, could not have been appreciable. As regards lubrication Mr. Denton gave an account of his experience with engines which had been cleaned out with ether, and in which no oil whatever had been used for months. The records obtained under such conditions, when compared with data from the same engines using oil in the cylinders, showed no difference worthy of special note. The fact that engines showed less friction under the heavier loads than under the lighter ones Mr. Denton explained by the assumption that the various journals, through the reversal of motion of the reciprocating parts of the engines, developed a suction-pump action, drawing in the lubricating oil, and that this action was more vigorous when the engines were fully loaded.

Mended Cast Iron.

American Artisan.

Small ornaments of cast iron are often broken, and the owner is generally told that they cannot be mended. This is a grevious mistake. Cast iron can be successfully soldered, if properly treated in the first instance, so as to give it an affinity with tinners' solder. Cleanse the face of the broken article from all impurities, if the fracture is an old one, then with a brass wire scrubbing brush scrub the faces of the fracture until they appear perfectly yellow—until, in fact, they become dry-plated, so to speak, with brass; the rough cast iron rubs off the brass very easily and quickly, then the brazed surfaces are tinned just as brass is tinned, and the parts can be strongly soldered together without difficulty.

EARLY IRON-MAKING IN ENGLAND.

Colliery Guardian.

At the opening of the session of the East of Scotland Engineering Association at Edinburgh, on Friday night, Professor G. F. Armstrong, of Edinburgh University, delivered an address in which he traced the effect of the introduction of iron from the time when these islands were being colonized by the Romans, whose success over the warlike and courageous Britons he attributed to superior knowledge and use of iron. The art of working iron was first introduced into Scotland about the fourteenth century by Andrea de Ferrara, but from the fifteenth till near the end of the sixteenth century the manufacture of iron in Britain was chiefly carried on in Sussex. Iron smelting was then quite an aristocratic pursuit, being followed by the Howards, the Percys, the Nevilles, the Sydneys, and other equally illustrious families. The substitution of coal for charcoal as a fuel changed the localities of the manufacture. After speaking of some of the metallurgists of the end of the 17th and 18th century, Professor Armstrong reviewed the history of the Coalbrookdale Iron Works, founded in 1709 by Abraham Darby. By 1763 the casting of parts of general pumping machinery and engines on Newcomen's principle, and rails for tramways, had assumed industrial proportions, and the year 1777 saw Abraham Darby the third engaged upon the construction of the first successful iron bridge ever erected—that which spans the Severn between the towns of Madeley and Broseley. Up till about this time the British iron industry had been confined to England and Wales, but in 1760 John Roebuck, the son of a Sheffield cutler, and a student of Edinburgh, came to Scotland as the founder of the subsequently famous Carron Iron Works. In the first year during which the works were in operation Roebuck succeeded in turning out 1,500 tons of metal, chiefly in the form of castings. It was in this connection that Roebuck subsequently became associated with James Watt, at first in experimental research, and afterwards as Watt's partner in the memorable enterprise which was destined to revolutionize the mechanical arts of the world. About the middle of the 18th century the total output was 18,000 tons per annum; by the end of the first quarter of the present century it had reached 400,000 tons, and a few years ago, when the trade was at its greatest activity, the production amounted to something like 7,000,000 tons in a single year—to more, that was to say, than that of Europe put together. The annual coal output of the United Kingdom was now about 120,000,000 tons, and something like a third of that might be said to be consumed in the production of crude malleable iron. The imperative duty which lay upon them was to endeavor to understand more and more the physical and chemical properties of the metal iron, to the end that they might, as their early forefathers did, learn to regard it as a precious thing, and not as reckless prodigals continue to employ it wastefully in the machines and structures they were called upon to design.

Points about Pumps.

Mr. Wm. O. Webber's paper on "Centrifugal Pumps and their Efficiencies," read at the recent meeting of the American Society of Mechanical Engineers, was very interesting and suggestive. The paper contained a number of interesting tables and diagrams giving the results of a series of tests which had been made. It was stated, among other things, that perhaps the first centrifugal pump, in a primitive state, was brought out by the mathematician Euler (an account of which was published in the proceedings of the Academy of Berlin for 1754), and which was probably a failure in a practical sense. The next pump to attract attention, and one which is credited more nearly to have approached the efficiencies of the present day, was one erected by a Mr. McCarty in the New York Navy Yard in 1830. Then followed, in 1851, at the great London Exhibition, the celebrated Appold pump, which is really the first pump of which an authentic set of experiments are available. Mr. Appold determined that the efficiency mainly depended upon the form of blades in the fan and the shape of the volute of enveloping case, and that the best form for the blades was a curve pointing in opposite direction to that in which the fan revolved, and, for the case, that of a spiral tapering pipe or volute.

Where the Waste Goes.

"I see Edison claims that only about one-fourth of every ton of coal is utilized by the consumer."

"So? I didn't think the dealer measured it quite as short as all that."

Industrial Notes

Blast Furnacs:—

There is some talk of moving the Lake Huron Furnace, Michigan, to Birmingham, Ala.

The coke ovens, at New Castle, Pa., have shut down indefinitely. It is said that the industry was not a profitable one.

The Carbon Limestone Company, Mahoning township, has orders for over one hud lred cars of limestone per day.—[New Castle (Pa.) Guardian.

The Fayette furnace was blown out last week in order to repair the engine, upon the completion of which the blast will be resumed.—[Neguanee (Mich.) Iron Herald, Nov. 24.

Iron & Steel furnace is running as usual. Their fuel is now ¾ coke and ¼ coal. Belfont is turning out 50 tons a day, mostly No. 1. It is using 80 per cent. native and 20 per cent. Missouri ore.—[Ironton (O.) Register.

The Virginia, Tennessee & Carolina Iron & Steel Co., of Bristol, Tenn., has commenced improving its property, and is, it it said, negotiating for the formation of a company to build a 100-ton furnace.

No. 2 furnace of the Stewart Iron Company, at Sharon, Pa., which has recently been relined ahd otherwise repaired, has not as yet resumed operations. It will probably blow in before the first of the year.

The Phœnix furnace, of Brown, Bonnell & Co., Youngstown, O., is being relined and a number of improvements added. It is one of the oldest furnace plants in the Mahoning Valley, and will be put in blast early the coming month.

A press dispatch from Bellows Fall, Vt., says: "Parties who have been mining iron and manganese in South Wallingford for several months past have struck, at a depth of 600 feet, the most extensive deposit ever found in this section. The iron is in so pure a state a state that it is shipped as it comes out to Bessemer, where, being mixed with other metal, it is said to form the best quality of steel. The deposit shows that at some time in the past great heat has caused the melting and running together of the metal, leaving it free from impurity. From 50 to 100 tons per week are being shipped. It bids fair to be a great and paying industry for that sectiou. Another lead has been started, which will in a short time reach the depth of 850 feet from the entrance."

Steel Works:—

The Worcester Steel Works, of Worcester, Mass., have commenced active operations again, after their shutdown last month.

The American Steel Vehicle Wheel Company is the name of a new company who have just been organized by Pittsburgh capitalists, the capital stock of which is $100,000, and is to be increased to $300,000 if necessary.

The Eureka Cast Steel Company, of Chester, Pa., have just closed a contract with the United States Mitis Company, for the right to manufacture wrought iron and steel castings by their, the Mitis, process. They have the sole right, with but one exception (that of the Midvale Steel Company, of Philadelphia).

The Standard Steel Casting Co., Thurlow, Pa., have commenced the construction of an addition to their works, 130x95 ft., and put in a traveling crane of 30 tons capacity. The company will also build a new open-hearth steel furnace, which, with their present one of 10 tons, will enable them to handle very large castings.

Rolling Mills:—

The Kittaning Iron Mill, Kittaning, Pa., has shut down indefinitely, on account of a dispute with the puddlers about the iron.

The puddling departments of the Scottdale, Pa., rolling mill were put in operation on Monday morning, after an idleness of six months. Th sheet mills will not be started until there is a good supply of muck iron manufactured.—[American Manufacturer.

The Ætna or Union Rolling Mills are working steady, full-handed. These mills have never been idle since the fire, except for the yearly repairs in July, and the prospect for the future is very encouraging.—[South Cleveland Advocate.

The puddle mill and Booth rod mill started up on Wednesday morning. The 18-inch mill is working on angle iron. Every department of the Cleveland Rolling Mill Company's works are now in operation.—[South Cleveland Advocate.

The North Chicago Rolling Mills, at South Chicago, have been gradually getting matters in shape for a general suspension of operations, and by the evening of the 3d inst. the entire works were shut down, except the blast furnaces. The steel works and rolling mill will be thoroughly repaired, which will take from January 1st to the 15th. The works at North Chicago will continue in operation until the repairs at South Chicago are completed, when they will be closed for a general overhauling.

A decree of confirmation of the sale of the Riverside Rolling Mill property to R. W. Wilson has been given by Judge Buchwalter and a partial distribution of the proceeds ordered. The Master Commissioners have $13,333.34 in their hands, the amount of the first payment. Of this amount $523.50 is decreed to the Master Commissioners for fees and expenses; $808.60 to Harlan P. Lloyd, the trustee of E. L. Harper & Co., and $695.28 to the Treasurer of Hamilton county for taxes and penalty for the last half of 1886. The balance, together with the notes and mortgages securing the deferred payments, is to remain in the hands of the Master Commissioners until further order of the Court. The question of the right of dower of Mrs. Emma B. Harper is reserved for further consideration.—[Cincinnati Telegram, December 7.

Machine Shops:—

The contract has been let for building the factory of the Birmingham (Ala.) Safe and Lock Company. It will be 125x200 feet, two stories.

The shops of the Warder, Bushnell & Glessner Co., at Springfield, Ohio, are being furnished with 600 electric lights, at a cost of about $6,000.

The Standard Machine Company, of Bay City, Mich., will build shops at Chattanooga, Tenn., under the name of the Chattanooga Machine Company.

The Ohio Falls Car Works, Jeffersonville, Ind., who have recently spent $100,000 in improving their works, have further improvements in contemplation.

The contract for the erection of the car wheel and car spring manufactory at Decatur, Ala., has been awarded. There will be several buildings, the main one to be 80x 275 feet. The works will be in operation by January 1, 1888, and will turn out 100 car wheels a day.

The new buildings now being erected at Chattanooga, Tenn., for the William Anson Wood Mower & Reaper Company would not be ready for occupancy before April next, and that the manufacture of mowing machines would be resumed here at once and continued until spring.—[Youngstown, O. Telegram.

Foundries:—

The force of men in the car-wheel department of the Union Foundry and Car Wheel Works, at Pullman, Ill., have been doubled recently, on account of the constantly increasing orders to be filled.

The Andrews Brothers Co., of Hazelton, O., founders, has been incorporated. Capital stock, $500,000. Chauncey H. Andrews, L. E. Cochran, James Neilson, H. W. Heedy and H. W. Calvin, incorporators.

R. J. Redmond, John A. Redmond, B. R. Stevenson and H. J. Morton, of Clifton, W. Va., and E. S. Grant, of Middlesport Ohio, have chartered the Hampden Foundry and Machine Co., at Clifton, to manufacture stoves, machine work, etc. The capital stock is $10,000. —[Ohio Valley Manufacturer.

Hardware:—

N. F. Acers will establish a horseshoe factory at Leavenworth, Kansas.

A cutlery factory is to be erected in Wilkesbarre, Pa., by Philadelphia capitalists.

The Lufkin Rule Co., Cleveland, have lately brought out a very convenient pocket rule of spring steel, enclosed in a leather case and adapted in size to the vest pocket.

The National Association of Wrought Iron Pipe Manufacturers met in Pittsburgh, Dec. 1, and reaffirmed the old scale of prices. All the factories in the country were represented.

The Belleville Nail Company, Belleville, Ill., have resumed operations with a full force of men. This plant has been closed for three weeks on account of a scarcity of water. They now have a good supply and at present prices will continue in operation.

At Lebanon, Ohio, November 26, Professor Wendlin Zimmerman, of the Normal University, having occasion to study the work of a steam engine preparatory to a lecture upon the subject, visited Greeley's flouring mill. Somehow he fell into the pit of the fly-wheel, which was making 130 revolutions per minute. When the machinery was stopped the body was broken to pieces.

LAKE SUPERIOR IRON ORE PRODUCTION, '87.

We reproduce to-day the Marquette *Mining Journal's* tabular statement of the ore production and shipments, by lake, of the Lake Superior country, during 1887. The following are the shipments by ranges and ports respectively:

Marquette Range	1,764,251
Menominee	1,151,711
Gogebic	1,092,428
Vermilion	390,467
Total lake shipments, 1887	4,398,857
" " 1886	3,493,186
	905,671

Name of Port.	1887.	1886.
Marquette	803,411	853,396
Escanaba	2,072,708	1,738,821
St. Ignace	91,544	74,690
Ashland, Wis	1,040,727	721,983
Two Harbors Minn	390,467	304,396
	4,398,857	3,493,186

The production of each mine, by ranges and shipping ports, will be found in the following table:

MARQUETTE—MARQUETTE DISTRICT.

American	370	Winthrop	11,365
Buffalo	9,440	Humboldt	17,874
Jackson	18,192	West Republic	12,882
Marquette Ore Co	8,240	Republic	220,148
Rolling Mill	1,068	Republic Reduction Co.	87
Sam Mitchell	4,486	Phœnix	1,605
Milwaukee	31,351	Champion	143,011
Cliff Shaft	4,157	North Champion	896
Negaunee	1,839	Gibson & Mitchell	2,699
South Buffalo	4,964	Norwood	1,692
Cleveland	85,186	Michigamme	46,532
Lake Superior	47,683	Webster	2,074
Barnum	2,669	Beaufort	12,829
Salisbury	1,486	Titan	16,403
Detroit	14,602		
Pittsburgh and Lake Angeline	77,907	Total from Marquette	803,411

ST. IGNACE—MARQUETTE DISTRICT.

Cleveland	39,772	Lillie	5,089
Winthrop	28,713	Grand Rapids	712
Milwaukee	7,889	Wheeling	71
Champion	37		
Cliff Shaft	440	Total from St. Ignace	91,544
Lucy	9,331		

ESCANABA—MARQUETTE DISTRICT.

American	1,483	Pioneer	1,203
Barnum	13,454	Pittsburgh and Lake Angeline	111,552
Buffalo	10,708	Quarts L	4,355
Cambria	38,094	Quarts D	9,151
Cleveland	38,350	Richards	1,374
Cleveland Hematite	34,224	Salisbury	35,651
Cliff Shaft	66,634	Superior	108,306
Detroit	2,072	Superior Hematite	138,903
Jackson	13,962	Swanzey	2,842
Jackson South	17,774	Wheat	17,541
Lillie	17,953	Winthrop	33,949
Marquette	8,326	Iron Mountain	393
Mitchell	16,519	Lucy	2,143
Negaunee	3,420	Sam Mitchell	5,230
York	5,128		
Nonpareil	1,436	Total	869,296
Palmer	47,489		

ESCANABA—MENOMINEE DISTRICT.

Beta	1,226	Nanaimo	30,460
Chapin	332,230	Norway	95,726
Commonwealth	57,058	Paint River	10,240
Cornell	576	Perkins	16,834
Cyclops	14,297	Quinnesec	6,585
Delphic	2,272	Selden	1,302
Dunn	24,952	Sheiden & Shafer	2,397
Florence	77,402	Stephenson	3,589
Great Western	22,870	Vulcan	205,036
Hamilton	538	Youngstown	34,418
Hewitt	1,163	Walpole	1,043
Iron River	83,018	Sturgeon River	6,829
Ludington	61,788		
Mastodon	48,792	Total	1,151,711
Metropolitan	9,070		

ESCANABA—GOGEBIC DISTRICT.

Aurora	3,571	Pabst	1,326
Germania	5,090		
Iron King	9,992	Total	51,701
Norrie	29,999		
Odanah	1,793	Total from Escanaba	2,072,708

ASHLAND, WIS.—GOGEBIC DISTRICT.

Milwaukee, Lake Shore & Western Ore Dock.

Anvil	6,676	Kakagon	43,084
Ashland	52,957	Montreal	5,961
Aurora	110,300	Nimikon	23,217
Vaughn	2,101	Norrie	155,426
Blue Jacket	1,310	East Norrie	16,791
Bessemer	15,647	Odanah	21,553
Bonnie	1,004	Palms	1,414
Brotherton	21,721	Pabst	9,017
Colby North	67,069	Puritan	26,566
Colby South	86,482	Sunday Lake	14,533
First National	984	Superior	21,990
Germania	43,509	Parker	9,145
Iron Chief	2,249		
Iron King	47,001	Total	831,419
Ironton	24,762		

Wisconsin Central Ore Dock.

Ashland	93,350	Atlantic	1,319
Colby North	1,467		
Colby South	68,995	Total	209,308
Colby Section 15	12,996		
Montreal	18,477	Total from Ashland	1,040,727
Trimble	12,764		

TWO HARBORS, MINN.—VERMILION DISTRICT.

Minnesota Iron Co.'s mines	390,467
Grand total of lake shipments	4,398,857

The readers of *St. Nicholas* will discover in the December number, that Mrs. Frances Hodgson Burnett has created a worthy companion character to "Little Lord Fauntleroy," in the heroine of her story, "Sara Crewe; or, What Happened at Miss Minchin's;" and, as in the earlier story, the author's conceptions are aided in their setting forth by the work of the illustrator, Mr. R. B. Birch.

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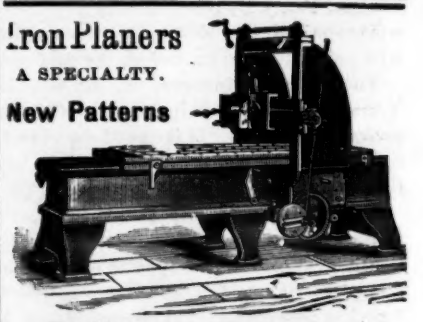

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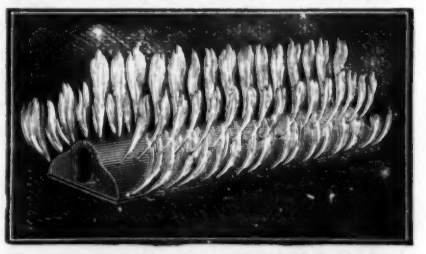

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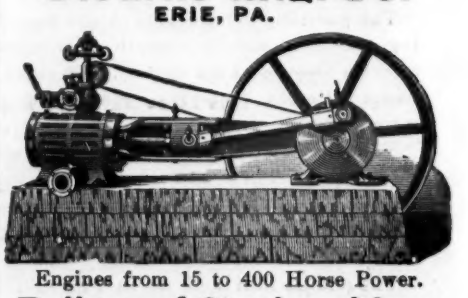

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MARKET REVIEW.

OFFICE OF IRON TRADE REVIEW.

CLEVELAND, O., WEDNESDAY EVENING, December 14, 1887.

Iron Ore.

The ore market remains in a state of "innocuous desuetude," no noteworthy transaction being reported for the week. Dealers are squaring up their shipping accounts and taking inventory, as it were, of their ore that is still for sale. Considerable inquiry is being received from interior points for high grades of Bessemer ores, but the supply is limited, the bulk of the unsold ore consisting of Non-Bessemer ore. The vesselmen have to some extent toned down their exorbitant demand and, by the time at which charters are usually made, will be found willing to accede to the reasonable demands of the ore producers. Despite the predictions of an increased ore output next season, the indications point to a restricted production in 1888. This forecast is based upon the lack of capital for developmental purposes, and the very small profits made by the majority of producers during 1887. We repeat our former quotations as follows:

No. 1 Specular and magnetic Bessemer ores per ton	$7 00@7 50
No. 1 Specular (non-Bessemer) ores per ton	6 00@6 55
Bessemer Hematites	5 75@6 70
Non-Bessemer Hematites	5 00@5 00

Pig Iron.

Despite the scare telegraphed from Philadelphia all over the country as to the alleged weakness of the iron market because of the President message, pig iron is held firmly in this market and the same condition of affairs is reported from the Mahoning and Shenango valleys. Iron makers of experience decline to be scared into lower quotations. The same thing, they say, has been tried before, and resulted disastrously to the trade, simply because the stampede was successful. There is no indication that Congress will carry out the President's recommendations and in the meantime the demand for iron continues good. The Chicago founders have entered the market as large January buyers, and one local firm reports the sale, to Ohio parties, of 1,500 tons of a high grade foundry iron for delivery February 1, at $20.50 cash at the furnace. The tone of the market is healthy and quotations are full. The following are the ruling prices, f. o. b. cars, Cleveland, four months:

CHARCOAL PIG IRON.

Lake Superior Charcoal all grades	22 50@24 00

BITUMINOUS AND COKE IRON.

No. 1 Bessemer	$ 21 85
No. 1 foundry, all lake ores	21 35@21 85
No. 2 same	20 35@20 85
No. 1 foundry, lake ores, with cinder mixture	20 85@21 35
No. 2 same	19 85@20 85
No. 1 silvery, native Ohio ores	21 00@21 50
No. 2 same	20 00@20 50
No. 1 gray forge, red short	20 35@20 85
No. 1 gray forge, neutral	18 85@19 35
No. 1 American Scotch (Black Band)	21 53
No. 2 American Scotch "	20 53

Manufactured Iron.

Dealers report increased demand for bar iron at $1.80, and although large contracts might be made at a lower figure, some heavy holders decline to cut the price, and purchasers will have to come to the views of the mill men. The new year is looked forward to with confidence, and better prices are expected all along the line. Sheets continue in strong demand, at the old price.

Scrap Iron.

No transactions are reported save a sale of 500 tons of old American rails at $23, which is a drop of $1.00 a ton.

Hardware.

Little is to be said under this head beyond the general statement that the present is the most flourishing season the hardware men have experienced for many years. They are two weeks behind on orders, and are working day and night to catch up. Copper, tin and lead are still on the rise, copper especially going to the op.

CINCINNATI PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co.

The market is unquestionably more active than at any time for the past month. The talk of buyers has pointed so universally to January buying, that many of them begin to fear a too stimulating effect upon the market next month, and are anticipating. This has led to some quite large transactions already closed, and a good many others under consideration. More Southern iron is now called for than at any time since the first of the year. Buyers claim to be able to buy the leading grades very advantageously, but the furnaces having met the recognized decline of about $1.00 per ton in the past three months, decline to go any lower, and are booking orders on that basis much faster than they are making the iron. Everything points to a large buying in January, and it will be quite remarkable if there is not a firmer feeling in consequence. Southern No. 2 foundry is held at $19.50 cash Cincinnati, but buyers claim to be offered good brands at $19.00. This fairly represents the basis of the Southern iron market. We quote for cash f. o. b. Cincinnati (December 12):

HOT BLAST FOUNDRY IRON.—Ohio and Southern Strong Coke, No. 1, $20 00@$20 50, Ohio and Southern Strong Coke, No. 2, $19 00@$20 00; Ohio and Southern Strong Coke, No. 3, $18 00@$19 00; Ohio Soft Stonecoal, No. 1, $20 00@$20 50, Ohio Soft Stonecoal No. 2, $19 00@$20 00; Mahoning and Shenango Valley coke, No. 1, $20 50@$21 00. CHARCOAL IRON.—Hanging Rock, No. 1, $23 00@$24 00; Hanging Rock No. 2, $22 00@$23 00; Tennessee and Alabama, No. 1, $21 00@$21 50; Tennessee and Alabama, No. 2, $19 50@$20 50. FORGE—Strong Neutral Coke, $17 00@$18 00; Mottled Coke, $16 00@$16 50; Cold Short, $16 00@$17 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel Iron, $23 00@$24 00; Hanging Rock Cold Blast, No. 1, $24 00@$25 00; Lake Superior Malleable, $22 50@$23 50.

CHICAGO PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co., W. W. Backman, Resident Agent.

Numerous orders for quick delivery continue to be the feature of the market. In the past two weeks foundrymen have recovered their spirits on receiving some good contracts, and feel more confident than ever that the coming year will be one of large activity. Most of them have permitted their stocks to run down pretty low, and will therefore have to place orders before very long. The general talk is January, but a disposition is shown by some to take hold this month. Much inconvenience results from the slowness of railroads in delivering iron on the spot delivery orders, and agents have more than the usual share of trouble on this account. We quote for cash, f. o. b. cars, Chicago (Dec. 10):

Coke and Coal Foundry:—Ohio Hanging Rock softeners, No. 1, $21 50@22 50; Ohio Jackson county, softeners, No. 1, $21 50@22 00; Ohio, Black Band softeners, No. 1, $22 00@22 50; Lake Ore and Cinder softeners, No. 1, $21 00@22 00; Southern coke foundry No. 2, $20 50@21 00; Southern coke foundry No. 2½, $20 00@20 50; Southern coke foundry No. 3, $19 50@20 00. Old Materials:—Old American Rails, $23 00@23 50; Old wheels, $20 50@21 50. Charcoal Foundry:—Lake Superior, $21 50@22 50; Southern, $21 50@23 00; Hanging Rock, $24 00@25 00. Car Wheel and Malleable:—Lake Superior, $21 50@22 50; Standard Southern, $25 00@26 00; Hanging Rock Cold Blast, $26 00@28 00; Hanging Rock Warm Blast, $24 50@25 50.

ST. LOUIS PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co.

This market has been unusually dull for the past two weeks. Consumers of iron regard the situation as wholly in their favor, and are generally delaying purchases until next month. This policy has made local sellers somewhat anxious and eager for orders, but the furnaces are receiving liberal orders from other markets, and decline to make concessions needed to book orders. We quote for cash at St. Louis (Dec. 10):

Charcoal Foundry Irons.—Missouri, $20 00@21 00; Southern, $20 00@$21 00. Coal and Coke Irons.—Southern, $20 00@21 00, Ohio Softeners, $21 00@24 00. Mill Irons—Missouri, $19 00@19 50; Southern No 1, $17 50@18 50. Car Wheel & Malleable Irons—Southern, $22 00@23 00; Lake Superior, $22 00@23 00; Connellsville Coke, East St. Louis, $6 15.

PITTSBURGH PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by A. H. Childs.

The pig iron market continues quiet, and there are rumors of still greater decline in prices. Buyers content themselves by buying only what is needed to cover present wants, and are not disposed to anticipate future requirements. The volume of trade is maintained. In the absence of important transactions, quotations are (Dec. 12):

PIG IRON.—No. 1 Foundry, $19.75@$20.25; No. 2 Foundry, $19.00@$19.75; White and Mottled, $16.50@$17.00; Gray Forge $17.25@17.75; Warm Blast Charcoal, $21.00@$24.00; Cold Blast Charcoal, $25.00@29.00; Bessemer, $19.50@20.50, four months.

A Factor of Safety.

It is a settled fact in mechanics that no piece of machinery, whether it be a belt, shaft or gear, should ever be submitted to a strain greater than one-half of its breaking strength; it follows that a belt to be lasting and durable should not be subjected to a strain greater than 100 pounds to the inch in width. It is also an established fact that a leather belt passing over the face of a turned cast-iron pulley embracing one-half of its circumference, will give a fractional force equal to forty per cent. of the stress, so that if a belt one inch wide is passed over the face of an iron pulley embracing one-half of its circumference, and subjected to a stress of 100 pounds, the fractional or driving power will be forty pounds. If this force of forty pounds is carried forward at a speed of 1,000 feet per minute, it is evident that this force will be equal to 40,000 pounds at one foot per minute.—[Manufacturers' Gazette.

Reduced Rates for Holidays.

The Lake Shore Railway will sell round trip tickets to local points on its line December 24th, 25th, 26th and 31st, 1887, and January 1st and 2d, 1888, at one fare for the round trip; limited to January 3d, 1888, for return.

AN AMERICAN APPRENTICE SYSTEM.

Col. Richard T. Auchmuty, the founder of the New York Trade Schools, on First Avenue, 67th and 68th streets, read a paper Thursday evening before the Polytechnic Section of the American Institute on "An American Apprentice System."

After referring to the decay of the old apprentice system, caused by the sub-division of labor and the inability of the master mechanic to bestow much personal care on the apprentice, it was argued that the only method by which it was possible to train American mechanics who could compete with foreign workmen was a combination of the Trade School with real work—the Trade School first to gain skill and to acquire what is now in danger of being forgotten, the knowledge of the science on which a trade is based, then real work to gain speed of execution and skill. To apply, in short, the same system of education to the trades as is now followed in the professions.

Col. Auchmuty maintained that this was "no paper plan devised in a study", but was the result of the experience gained while instructing over one thousand young men at the New York Trade Schools, many of whom were now earning three or four dollars per day and some of whom were master mechanics. Excellent specimens of plumbing work, of wood carving and stone cutting were exhibited, the result of one season's instruction. Attention was also called to a large West Side Apartment House, the brickwork of which was done almost entirely by Trade School graduates.

Now that it has been demonstrated that Trade Schools could teach the American lad how to work, it rested with the master mechanics to give him employment. Two associations, the Master Plumber and the Silversmiths, had asserted their right to do so, notwithstanding trade union rules to the contrary. The opposition of the journeymen, most of whom were of foreign birth, to allowing boys to learn the trades was attributable, Col. Auchmuty stated, to their dread of competition and over-production. This was a groundless fear. The labor of young men who had been taught how to work would if properly utilized lower the cost of the product without lowering wages. Over-production came from high prices not from people having too much.

The tendency of trade union regulations in regard to production was to enhance prices, contract the market and to make the poor poorer.

Value of Train Telegraphy.

Electrical World.

The uses of train telegraphy continue to manifest themselves. One of the latest brought to notice was that in which the system served to bring prompt medical assistance to a lady taken ill on board a Lehigh Valley train. The operator sent a message, bringing a doctor to the next station, and the sick person was immediately tended and relieved. The same system was also employed to call a carriage to the depot for the lady on her arrival, and to summon a locomotive to take the doctor home. That all this could be done easily and effectively by means of telegraphy from a moving train shows that the traveling public has gained an appliance of no mean value for greater comfort and safety.

Electrical Railroads.

Electrical World.

So well pleased is Scranton with its electric road that another is being added, while all through Pennsylvania the success and economy of the road have set on foot dozens of electric railway enterprises, many of which will soon be carried out. Down South a number of electric railway plans are maturing, and out West there are indications of great activity in the same line of work. California is a particularly inviting field, and promises soon to have more electric roads than any other state. Coming nearer home, we find Brooklyn with an electric road, six miles long, just gone into operation, and with plans made, or agitation going on, for half a dozen more. Altogether the outlook in this department is very bright.

Holiday Excursions.

The Pennsylvania Lines West of Pittsburgh will sell excursion tickets at one fare for the round trip from all stations December 24th, 25th, 26th and 31st, 1887, and on January 1st and 2d, 1888. All tickets good returning until January 3d, 1888. No excursion tickets will be sold to adults for less than 25 cents, nor to children for less than 15 cents. No excursion tickets will be sold on Dec. 27th, 28th, 29th and 30th, 1887. For further information call on or address nearest Ticket Agent Pennsylvania Company. 4t

Cleveland Foundry.

Castings

For Machinery and Rolling Mills

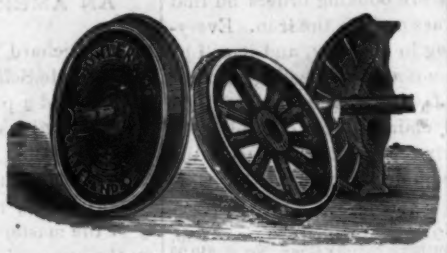
Car Wheels

all sizes and kinds, with and without Axles.

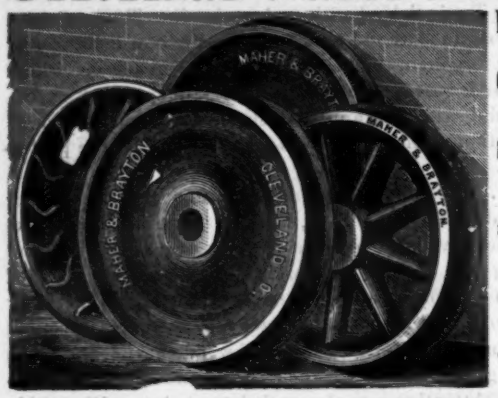
Chilled Faced R. R. Frogs

STREET RAILROAD TURNOUTS.

Nos 9, 11 & 13 Winter Street. } Bowler & Co



CLEVELAND WHEEL & FOUNDRY WORKS.



MAHER & BRAYTON, Proprietors,

Manufacturers of

Car, Engine, Truck and Tender Wheels.

RAILROAD, ROLLING MILL and Machinery Castings.

and Street Railroad Wheels and Turnouts.

ALSO

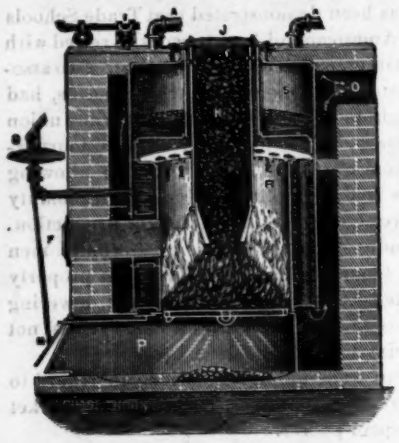
Chilled-Faced Railroad Frogs.

Office: 20 Carter Street,

Works: Cor. Carter and Collins Streets.

Cleveland, Ohio. 32

OVER 5,000 IN USE.



The Dunning Boiler,

Patent Wrought Iron or Steel, with Self-feeding Coal Magazine, is the oldest and best for **Low Pressure Steam Heating**, and insures a warm house Day and Night.

MADE AS FOLLOWS:—As a Magazine Boiler which requires attention but once in twenty-four hours; as a Surface Burner, to burn hard or soft coal, wood or coke; as a Hot Water Boiler, for greenhouses and hot water heating; as a Portable Boiler, to be set without brick-work. Also in two sections to pass through any door where a larger one cannot be used. Made in 13 patterns, 51 sizes. Send for Illustrated Catalogue, with full description and price list.

Keeps Steam Up Constantly. Agents Wanted.

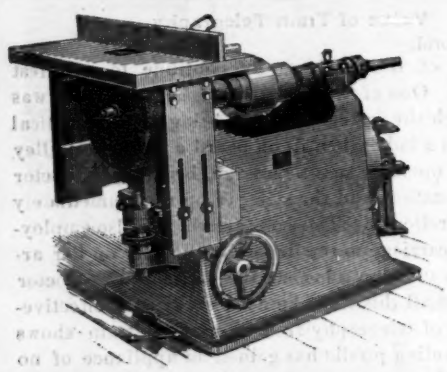
N. B.—Correspondence solicited from architects and persons building.

MANUFACTURED AT THE

New York Central Iron Works,

80 Exchange Street, Geneva, N. Y.

23-3m



EMERY WHEEL

Surfacing Machine.

Base of machine has sufficient flare to give solid floor foundation.

Table is so supported that it cannot spring under heavy weights. Solid emery wheels or wood covered wheels can be used, and table is easily adjusted to wearing away of wheel. Machine is well proportioned and thoroughly built. Write for circular.

Springfield Glue & Emery Wheel Co.

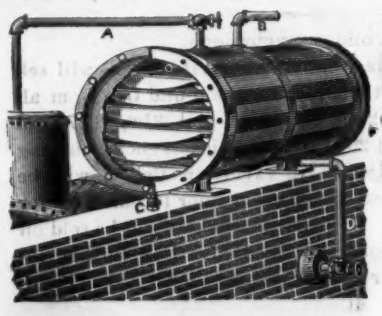
SPRINGFIELD, MASS.

Sharon Boiler Works,

(Limited)

SHARON, PA.

All kinds of Boilers and Sheet Iron work.



THE HOPPES

Feed-Water Purifier.

CLEAN BOILERS GUARANTEED, AND TIME GIVEN FOR TRIAL.

Durable in Construction. Efficient in Operation.

HARD SHEET STEEL TROUGHS.

Easily Cleaned.

Send for Descriptive Circular **A.**

Hoppes Manufacturing Co.

73 Springfield, O.

Iron Clad Paint Co.

actory 75 & 77 Central Way. Sec & Treas. No. 3 Case Building.

CLEVELAND, OHIO.

Trade Mark Patented—Paint Patented

Order direct from the **Iron Clad Paint Co.,**

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green and now owned by this Company.

IRON CLAD PAINT is the most durable, most fireproof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil.

Used by Nearly all the Railroads. 63

ALEXANDER NIMICK, President. GLENDY S. GRAHAM, Secretary. ARTHUR BRITTAN, Manag. & Treas.

Nimick & Brittan Mfg. Co.,

PITTSBURCH, PA.,

Manufacturers of

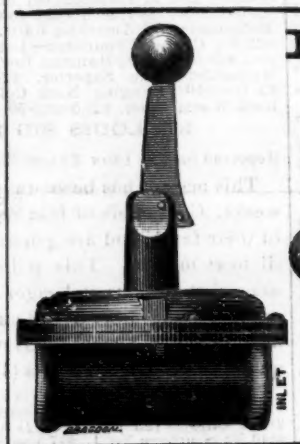
BUILDER'S FINE HARDWARE

Patent Burglar Proof Door Locks,

Knobs, Sash Locks and Padlocks,

Genuine Bronze and Imitation Bronze Goods.

Large Catalogue mailed on receipt of 50 cents. A condensed Catalogue mailed free. 11



L. L. LORD.

General Agent, MEADVILLE, PA., for

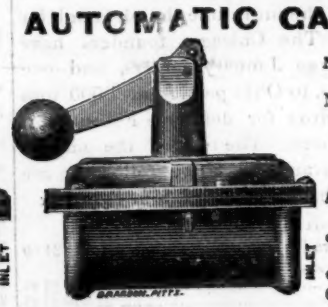
HAZLET & BEMAN'S

AUTOMATIC GAS SHUT-OFF

(Patent pending.)

No Explosions From Natural Gas.

No Valve Wedge or Spring to stick. All valves thoroughly tested and warranted.



ALSO AGENT FOR:

JACKMAN'S Atmospheric Gas Lamp,

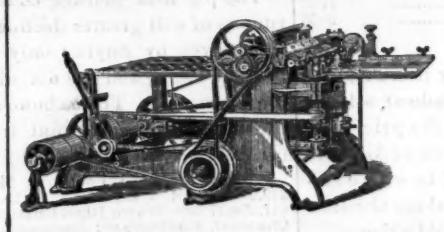
The best burner for natural or artificial gas on the market.

Send for price list and circular to **L. L. LORD,**

60 MEADVILLE, PA.

WOOD-WORKING MACHINERY

—FOR—



Planing Mills,

Railroad Shops,

CAR BUILDERS,

Carriage, Sash, Door, Blind and Cabinet Makers.

Send for Catalogue. [05] **FRANK & CO., Buffalo, N. Y.**

HERCULES POWDER

HERCULES,

THE GREAT STUMP AND ROCK

ANNIHILATOR.

SEND FOR DESCRIPTIVE PAMPHLET

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE

Known to the Arts.

POWDER, FUSE, CAPS,

Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING,

FOR SALE BY THE

HERCULES POWDER COMPANY,

40 Prospect street, Cleveland, Ohio.

J. W. WILLARD, Manager.

CLEVELAND WHOLESALE PRICES.

HARDWARE.

Anvils.

per lb.

American.....10cts dis 20@20&5
Wrights.....10c

Anvil Vise and Drill.

Millers Falls Co. $18.....dis 20
Cheney Anvil and Vise.....dis 25

Augers and Bits.

Common augers and bits.....dis 60&10
Snells.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small. $18; large, $26.....25
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₱ doz. $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₱ doz., $48.....dis 20&10
Gimlet bits.....per gross $4 50
Standard Bit Stock Drills.....dis 50&10&10
Ship Augers.....dis 15@15&10

Awl Hafts.

Sewing, brass ferrule,.....₱ gross $3.50, dis 45
Patent sewing, short.....₱ doz $1.00, dis 40&10
Patent sewing, long.....$1.20 ₱ doz net
Patent peg, plain top, ...$10.00 ₱ gro., dis 45
Pat. peg, leather top, ...$12.00 ₱ gro., dis 45

Awls, Brad Sets, &c.

Awls, Sewing, Common.....₱ gross $1.75—dis 45
Awls, Shouldered Peg ₱ gross.....$3.00—dis 45
Awls, Patent Peg.....₱ gross 75c—dis 45
Awls, Shouldered Brad.....$3.00—dis 10
Awls handled brad.....$7.80—dis 30
Awls handled. scratch.....$7.50 ₱ gro dis 35&10
Awls, socket scratch.....$1.50 ₱ doz dis 25
Brad Sets. No. 42, $10.50; No. 45. $12.50.....dis 60
Brad Sets, Stanley's Excelsior, No, 1. $7.50.....dis 30

Axes.

Makers' and Special Brands—
First quality.....₱doz. $7 00
Others.....₱doz. $5 75@$6
Full polished.....$8 00

Axle Grease.

Frazier's. in bulk.....keg ₱lb 4c; pail 5c net
Frazier's, per gross.....$9.50

Bag Holders.

Sprengle's pat., ₱ doz $18.....dis 60

Balances.

Spring balances.....dis 45
Common 24lb.....₱doz $1.50 dis 50

Bells.

Hand. light Brass.....dis 70
Hand. White Metal.....dis 60
Hand, Silver Chime.....dis 25&10&5
Hand, Globe (Cone's Patent).....dis 25&10@35
Gong, Abbe's.....dis 25&10
Gong. Nichols.....dis 40
Gong, Barton's.....dis 40&10
Cow, western.....Sargent's List 70
Call.....dis 33⅓
Farm bells.....dis 70
Steel alloy, church and school.....dis 40

Bellows.

Discount.

Blacksmith's.....{ Hill's.....40 / Bullock's.....5 &10
Moulders, ...discount 40
Hand. .....discount 40

Belting, Rubber.

Boston Belting Co.'s standard.....dis 60&10
" " " extra.....dis 50&10
" " " best.....dis 45
Cleveland Rubber Co., extra standard...dis 60&10
Shultz Raw Hide Leather Belting, single, dis 30
" " " " double, dis 35
Standard, oak tanned.....dis 50
Alexander Brothers' Pure Oak Tanned—
New list Oct. 1st, 1887, less.....35

Bench Stops.

Hotchkiss's ₱ doz $5.00.....dis 10
Weston's ₱ doz No. 1, $10.00; No. 2, $9 dis 25&10&5
Morrill's.....₱ doz $7.50 dis 25

Bit Holders.

Extension, Barber's.....₱ doz $15 00, dis 25
Diagonal.....₱doz $24.00 dis 40
Angular.....₱ doz $24 00, dis 40

Blind Staples.

Barbed ¼ inch and larger.....₱ lb8@8½c net
Barbed ⅝ inch.....₱ lb 9@9½c net

Bolts.

Cast iron barrel bolts.....70
Cast Iron shutter bolts, etc.....70
Cast iron chain bolts.....65
Ives patent door bolts.....55
Wr't iron barrel bolts.....70
Wrought iron square bolts.....70
Wrought shutter bolts.....60

Sargent's list

Carriage com. new list.....70&10
Tire, common, new list.....65&10
Carriage and tire, Philadelphia pattern.....75&10
Stove bolts.....60
Plow bolts.....50
Machine.....70
Ends.....dis 70

Blind Fasteners.

Van Sand's Screw Pattern $15 ₱ gross—dis 60&10
Van Sand's Old Pattern.....$15 ₱ gross—dis 50&10
Automatic for wood.....$10.50
" " " brick.....$13.50 } 20

Borax.

₱ lb.....9c

Boring Machines.

	Without augers.	Upright	Angular
Snell's. Rice's patent	5 50		6 75 dis 40&10
Lawrence	5 50		6 75 dis 45@45&10
Other machines	2 35		2 75 .....net
Phillips, with augers	6 00		7 00.....25

Braces.

Barber's.....discount 50
Spoffard's Patent.....discount 50@50&10
Bartholomew's Nos. 25, 27, 30.....dis 50&10
Bartholomew's Nos. 117. 118, 119 .....dis 70
Amidon's corner brace .....dis 40@40&10
Pecks.....dis 60

Brackets.

Shelf, plain, Sargent's list .....55&10
Fancy " " .....dis 60&10
Reading, plain .....dis 55&10
Reading, rosette.....dis 60&10

Bright Wire Goods.

Regular List.....75&10@75&10&5

Broilers.—Henis' self basting.

Inch	9	10	9x11
Per doz	$4 50	5 50	6 50

Buckets, Galvanized.

Iron clad 10 qt $2 75; 12 qt $3 00; 14 qt $3 75

Bull Rings.

Humason, Beckley & Co.'s.....dis 70&10
Peck, Stow & W. Co.'s.....dis 50&10
Eilrich Hardware Co., white metal low list dis 50 @50&10

Butts.

Discount

Wrought brass.....75&10@80
Cast brass, loose joint.....33⅓&10to33⅓&10&10
Cast Iron—
Fast joint, narrow.....50&10&5
Fast joint, broad.....55&10&5
Loose joint.....66⅔&10&5
Loose joint, jap.....66⅔&10&5
Loose joint, jap. with acorns.....66⅔&10&5
Loose pin, acorns.....66⅔&10&5
Loose pin. japanned acorns.....66⅔&10&5
Loose pin.acorns.japanned, plated tips66⅔&10&5
Wrought steel—
Wrought, fast joint narrow.....65&10
Wrought. fast joint broad.....65&10
Wro't loose joint broad.....65&10
Table Butts. back flaps, etc.....65&10
Regular inside blind .....65&10
Light inside blind .....65&10
Loose pin.....65&10
Light loose pin.....65&10

(@ 70)

Can Openers.

Sprague No. 1 $2.00. 2 $2.25, 3 $2.50,.....dis50&10
Star.....$4 00 net
Domestic.....₱ doz $2 50, dis 45
National.....$1 25, dis 45

Caps—Percussion, ₱ 1000.

Hicks & Goldmark's
F. L. Waterproof, 1-10's 50c
E. B. Trimmed Edge, 1-10's 65c
E. B. Ground Edge, Cent. Fire, 1-10's 70c
Double Waterproof. 1-10's 1.40
Musket Waterproof, 1-10's 54c
G. D.....30
Elys waterproof central-fire.....$1.60
Elys E. B 56c

(dis. 25)

Cartridges.

Rim fire.....discount 60&2
Pistol and rifle.....discount 40&2
Military and sporting.....discount 30&2

Carpet Stretchers.

Cast steel, polished. .....₱ doz $3.25
Cast iron, steel points.....per doz80c
Socket .....₱ doz $1 75
Bullard's.....dis25

Cattle Leaders.

Humason, Beckley & Co.'s .....dis 75
Sargent's.....dis 66⅔&10
Peck, Stow & W. Co.....dis 50&10

Carpet Sweepers.

Queen.....₱ doz $16.00
Mystic.....₱ doz $16
Cottage .....₱ doz $15
Queen. with band .....₱ doz $18
King.....₱ doz $30
Garland .....₱ doz $18

Cards.

Horse and Curry .....dis 10

Casters.

Bed .....
Plate .....
Shallow Socket .....
Deep Socket.....dis 40&10
Yale Casters. list May, 1884. ...dis 30 &10@40
Martin's patent .....dis 45&10

(dis 50&10@60&5)

Chains.

Trace. 6½-10-2.....₱ pair 1.05
Trace, 6½-10-3.....₱ pair 92c
Trace, 7-10-2.....₱ pair 1.11
German Halter Chain. list June, 1884,..... dis 55
German Coil. list of June, 1881.....dis 55
Galvanized Pump Chain .....₱ lb 5½ to 5¾
Jack Chain, Iron .....75&10@75&10&5
Jack Chain, Brass.....dis75@75&10

(dis 50&5@50&10)

Chalk.

White .....₱ gross 55c
White Crayon .....₱gross 12@12½
Red 75c
Blue 85c

Chisels.

Socket Framing. and Frmer .....dis 75@ 75& 5
Socket Framing and Firmer. Buck, Bros.....dis 25
Socket Firmer & Framing. L. & I. J. White.....dis 30@30 & 5
Tanged Firmers.....dis 40

Clamps.

Snow's adjustable, iron.....dis 40
Hammer's adjustable, iron.....dis 15
Sargent's cabinet, iron .....dis 66⅔&10

Clips.

Axle and spring bar, Norway iron..... dis 55&5&5
Wrought-Iron felloe clips.....₱ lb. 5½c
Steel felloe clips.....₱lb5c

Cockeyes.

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¼ kegs, ₱ lb	4½c	5 c	3½c
1c lb cans, 10 in case	6 c	6 c	5 c
1c lb cans, less than 10	10 c	10 c	7½c

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Crown Jewel.....6-in. $3 50 each, dis 35
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U. M. C. & W. R. A.—P. E., 11up... 3 10
U. M. C. & W. R. A.—P. E., 9&10... 4 00
U. M. C. & W. R. A.—P. E., 7&8.... 4 90

(dis 20&2)

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Per doz Nos.	0	1	2	3	4	
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(.....dis 10)

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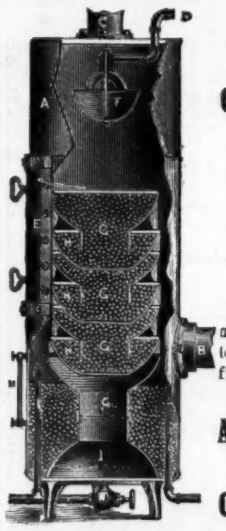

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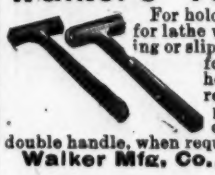

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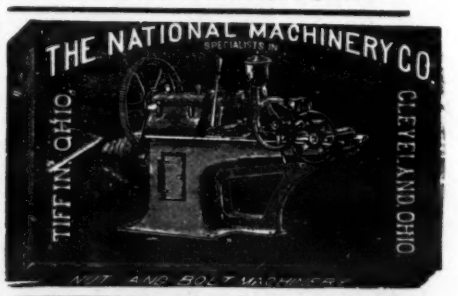
*** Copies sent by mail on receipt of price.



BALL & SOCKET JOINT
ALLOWING FAVORABLE ADJUSTMENT TO LIGHT
STEARNS' SILENT SAW VISES.
WITH RUBBER CUSHIONED JAWS.
THE FINEST FINISHED, THE LATEST IMPROVEMENTS, M'F'G BY
E.C. STEARNS & Co.
SYRACUSE, N.Y.
SEND FOR CIRCULAR
SOLD BY THE TRADE

Locks, Bolts, etc.

P. & F. Corbear, Locks & Bronze Goods.

Door locks, knobs and latches.....dis 50&10
Escutcheons and keys .....dis 50&10
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....50&10
Bell pulls, genuine bronze.....dis 50&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts, genuine bronze.....dis 60&10
Butts, bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges & flaps genuine bronze....dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze .....dis 60
Sash pulls and plates, genuine bronze .....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull genuine bronze..... dis 66⅔
Letter box plates, genuine bronze.....dis 60&10
Barn door locks .....dis 33⅓

Lemon Squeezers.

Porcelain lined.....₱ doz $6 00, dis 25&35
Wood..... ₱ doz $3 00. dis 25
The "Boss"..... ₱ doz $2.50
Dean's No. 1. ₱ doz $6 50: 2. $3 25;3, $1 90...dis
Little giant..... dis 50

Lines.

Cotton Chalk.....dis 40
Silver Lake, Braided, No. 0, $6.00; No. 1. $6.50; No. 2, $7.00; No. 3, $7.50 ₱ gross .....dis 25
Masons' Linen.....dis 40
Wire Clothes, No 18, $3.75; No 19, $3.25; No. 20 $2.75;.....

Lumber Tools.

Ring peavies, "Blue Line" finish.....₱ doz $20 00
Ring peavies, common finish.....₱ doz $18 00
Steel socket peavies.....₱ doz $21 00
Mall. iron socket peavies.....₱ doz $19 00
Cant hooks, "Blue Line" finish.....₱ doz $16 00
Cant hooks, common finish.....₱ doz $14 00
Cant hook's mall. socket clasp, "Blue Line" finish.....₱ doz $16 00
Cant hooks, mall, socket clasp, common finish.....₱ doz $14 50
Cant hooks, clip clasp, "Blue Line" fin..₱ doz $14
Cant hooks, clip clasp, common finish...₱ doz $12
Hand spikes.....₱ doz 6 ft., $15 00; 8 ft., $20 00
Pike poles, pike and hook—

	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
₱ doz.....	$11.50	$12 50	$14 50	$17 50	$21 50

Pike poles, pike only, ₱ doz.....$10 00 $11 00 $13 00 $16 00 $20 00
Pike poles, not ironed, ₱ doz..... $6 00 $7 00 $9 00 $12 00 $16 00
Setting poles, doz 14 00 $15 00 $17 00
Swamp hooks .....₱ doz $18 00
Landing blocks.....₱ doz $22 50
Skidding tongs.....₱ doz $51 00
Log binders.....₱ doz $26 00
Bended boot calks, 1 to 5 M, dis 25; 5 to 10 M, dis 30
Square steel boot calks..... dis 40
Chain rafting dogs.....₱ 100 $12 50
Ring rafting dogs..₱ 100, med., $10 00; large $12 00
Timber grapples.....₱ doz $30 00

Mallets.

Hickory .....dis 20&10
Lignumvitæ.....dis 2[illegible]&10
Penfield Block Co., Lignumvitæ and Hickory.....dis 30

Mattocks.

Regular list... ..... dis 60@60&5

Meat Cutters.

Dixon's (P.S.&W.)	1	2	3	4	
	₱ doz. $14.00	$17.00	$19.00	$30.00	dis 45
Draw Cut Nos.	5	2	6	8	10
Each.....	$50.00	$75.00	$80.00	$225.00	400.00

dis 20@25

Woodruff's (P S & W) per doz No 100 $15 No 150 $18 dis 45
Hale's—Nos. 11 12 13 $27 $33 $45 dis 70
Enterprise.....dis 30

Mincing Knives.

Am. (2d quality), ₱ gro, 1 blade, $7; 2 blades, $12; 3 blades, $18.....net
Smith's, ₱ doz. single, $4 50; double, $6 50 dis 40

Money Drawers.

Tucker's ₱ doz.....$18 @20

Molasses Gates.

Stebbins' pat .....dis 70
Stebbins' genuine .....dis 66⅔&10
Stebbins' tinned ends.....dis 40&10
Lincoln's pattern.....dis 66⅔&10
Scoville.....$7 45&10

Nails (wire).

List July 14 1887.....dis65&10
Standard Penny Nails, ₱keg card rate $2 80 to 2 90

Nuts and Washers.

Size of bolt in.....	¼	5-16	⅜	½	⅝	¾	1
Square.....	8⅛	7.3	5.8	4.9	4.3	4	3.6
Hexagon.....	21	12	8¾	6¼	5¼	5¼	4¾
Washers.....	7	5¾	4¼	4	3½	3½	3½

In lots less than 100 lbs, ₱ lb add ½c, 1lb boxes add 1c to list

Nut Crackers.

Table (Humason & Beckley Mfg. Co.).....dis 40
Blake's pattern.....₱ doz. $2 00, dis 10
Quakenbush.....$5 00 net

Oakum.

Government.....₱ lb 8 c
U. S. Navy.....₱ lb 7¼c
Navy .....₱ lb 6¼c

Oilers.

Zinc and Tin.....dis 60&10
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₱ doz.....dis 10@ 10&10

Packing, Steam.

Boston Belting Co .....dis 55
American Packing. .....10@11c
Russia Packing.....16c
Italian Packing.....16c

Pencils.

Faber's Carpenters' .....high list, dis 50
Faber's Round Gilt.....₱ gro $5.25 net

Picks.

Railroad, 5 to 6 lbs.....$12 dis 60@60&5
... .. 6 to 7 lbs.....$13 dis 60@60&5

Pinking Irons.

₱ doz .....65c. net

Picture Nails.

Brass head, Sargent's list..... } dis 50&10&10
Brass head, combination list.....dis 50&10
Porcelain head Sargent's list, dis.....50&10&10
Porcelain head, combination list.....dis 40&10

Plane Irons.

Sandusky Tool C .....dis 25

Pliers and Nippers.

Button's Patent .....dis 40
Hall's Pat. Compound Lever Cutting Nippers, No. 2, 5 in., $13.50; No. 4, 7 in., $21 00 ₱ Doz. .....dis 20&10@33⅓
Gas Pliers.....dis 50&10
Humason & Beckley .....dis 50
P. S. & W. Tinners' Cutting Nippers add 6 per cent. dis 10

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Post Hole and Tree Augers.

Samson Post Hole Digger..₱ doz. $36.00, dis 20&10
Eureka Diggers..... ₱ doz. $15 00 @ $16.00
Champion.....per doz $12.00
Vaughan's Hollow Tube Post Hole.....$24.00 dis40

Potato Parers.

White Mountain.....₱ doz $5.00@$5.50
Antrim Combination.....₱ doz $8.00
Hoosier .....₱ doz $13.50

Pruning Hooks and Shears.

Disston's Combined Pruning Hook and Saw ₱ doz $18.00.....dis 20&10
Disston's Pruning Hook....₱ doz $12.00 dis 20&10
Pruning Shears .....₱ doz 3.75@$4.00 net

Pulleys.

Hot House ..... discount 60&10
Japanned Screw..... discount 60&10
Brass Screw.....discount 60&10
Japanned Side.....discount 60&10
Japanned Clothes Line.....discount 60&10

Pumps.

Cistern, best makers.....dis 50@10&60
Pitcher spout, best makers....dis 60&10@60&10&10
Pitcher spout, cheaper goods... dis 70&5@70&10&5

Punches.

Saddlers' or Drive....₱ doz. good quality. 65@75c
Bemis & Call Co.'s Cast Steel Drive.....dis 50&5
Bemis & Call Co.'s Springfield Socket.....dis 50&5
Solid Tinners..... ₱ doz. $1.44, dis 55

Rails.

Sliding Door, Wrought Brass.....₱ lb 35c dis 20
Sliding Door, Iron, Painted... ₱ foot 6c dis 40&10

Rakes.

Cast Steel..... dis 65&5
Malleable..... dis 65&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher..... $10 @£...dis 10
Rifle Razor.....$9 50 net

Rivets.

Iron, Thousand, list November 17 ..... dis 50
Iron, Ordinary, Cooper's Block and Carriage, list November 17.....dis 50
Copper ..... dis 60&50&10

Rods.

Stair, Brass.....dis 25&2

Rollers.

Barn door, Sargent's list, ... dis 60&10&10
Acme (Anti-Friction).....dis 55

Rope.

Manilla, ½ inch and over.....12½c
Sisal, ½ inch and over..... 11½c

Rules.

Boxwood..... ..... discount 80&10@80&10&10

Sad Iron.

From 4 to 10 lbs.....per 100 lbs 3c
Self-heating.....₱ doz $9 net
Self-Heating, Tailor's.....₱ doz $18 net
Mrs. Potts's Irons. .....dis 40
Enterprise Star Irons.....discount 40

Sash Weights.

Per ton .....$22.50@$25.00

Saws.

Disston's Circular..... discount 45
Disston's hand panel, rip &c..... discount 25
W. M. & C., Champion Regular.....per foot 24c
W. M. & C., " Thin Back.....₱ ft 26c
Atkins' circular 50
Atkins' silver steel diamond X cuts.....₱ ft 75c
Atkins' concave tooth Dexter X cuts.....55c
Atkins' special steel diamond X cuts.....32c
Atkins' tuttle tooth X cuts.....30c
Atkins' hollow back X cuts.....21@22c
Atkins' shingle, mulay, drag, &c.....dis 45

Saw Frames.

White, Vermont.....₱ gross $12 00
Red, polished & varnished ₱ doz $1.50, ...dis 25

Saw Sets.

Aiken's Genuine.....$13.00, dis 50 &10
Morrill Saw Sets No. 1 $15.00; No. 3 and 4 $24.00 .....dis 40 &10

Scales.

Hatch, Counter, No. 171 .....₱ doz $21.00
Hatch, Tea, No. 161.....₱ doz $6.75@7 00
Chatillon's Grocers .....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882 dis 50&10

Scrapers.

Adjustable Box Scraper (S. R. & L. Co.) $6.50.....dis 30&10
Box, 1 Handle.....₱ doz $4.00, dis 10
Foot.....dis 50&10

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles dis 65&10
Stanley R. & L. Co.'s Black Handles.....dis 60&10
Sets Interchangeable.....₱ doz $18.00 dis 25

Screws.

Wood Screws—List Jan 27, 1887.
Flat head iron..... dis 70
Round head iron..... dis 65
Flat head brass..... dis 65
Round head brass..... dis 60
Flat head bronze 65
Round head bronze..... 60
(Extra .10 to soften given)
Machine, flat head, iron.....dis 55
Machine, round head, iron 50
Bench and hand—
Bench, iron .....25&10
Bench, wood, beech, per dozen $2.25.....
Bench, wood, hickory.....20 & 10
Hand, wood.....20&10
Lag or coach.....dis 66⅔@70
Coach, patent gimlet point..... 66⅔@66⅔&5
Bed.....25&5
Hand rail, ...66⅔&10

Saw Tools.

Atkins' patent.....₱ doz sets $6 00

Shears.

American (Cast) Iron.....dis75&10
Pruning .....See Pruning Hooks and Shears
Barnard's Lamp Trimmers.....₱ doz $4.00
Tinners'.....dis 20&2
Seymours List, Dec. 1881..... dis 60 &10&5
Seymours Tailor's Shears.....dis 33⅓

Scroll Saws.

Lester, complete, $10.00.....dis 25
Rogers, complete, $4.00. .....dis 25

Sheaves.

Sliding Door R. & E. list Dec 18, 1885... dis 55&2
Sliding Door, Patent Roller.....dis 60&10&2
Sliding Door, Pat'nt Roller, Hatfield's..... dis 70
Sliding Door, Corbin's Anti-Friction Dec. 18, 1885 dis 60&2

Ship Tools.

L. & I. J. White.....dis 20 & 5

Shovels and Tongs.

Iron Head.....50&10&5
Brass Head.....50

Sieves.

Metallic, new list.....dis 60&10
Flour sifters { Victor.....$2 00 / Hunter.....$2 25 / Comet.....$1 25

Slates.

School, by case..... dis 50&5@50&10

Spoke Shaves.

Iron.....dis 30
Wood .....dis 30

Spoke Trimmers.

Bonney's.....₱ doz $10.00 dis 50
Stearns'.....₱ doz $9.00 dis 20&10

Spoons.

Basting Spoons ..... dis 30&10
Britannia. .....dis 50
Rogers Bros. .....dis 50&10

Squares.

Steel and iron ..... } dis 70&10 75
Nickel plated.....
Disston's try square and T bevels ..... dis 45
Winterbottom's try and miter.....dis 30&10

Steelyards.

dis 40&10@50

Stocks and Dies.

Blacksmith's .....dis 40
"Lightning" screw plate .....dis 25

Stone.

Hindostan, No. 1, 6c; Axe, 4½c; Slips 9c
Washita Stone .....No. 1, ₱ lb 20
Turkey Oil Stone.....4 to 5 in.....₱ lb 40c
Turkey Slips.....$1.00@1.50
Washita Slips No 1.....₱ lb 37@38
Washita No 2 stone.....₱ lb 15c
Arkansas Stone 2.00

Stove Boards.

Zinc.....50&10
Daisy.....50&10

Shovels and Spades.

Ames' list Nov 1 1885.....discount 26
Dennis.....5.50
Hussey & Binns, rail road 8.00

Stove Polish.

Joseph Dixon's.....₱ gross $6 00 dis 10
Gem .....₱ gross 4 50 dis 10
Gold medal.....₱ gross 6 00 dis 25
Rising Sun.....₱ gross $5 50 net
Dixon's plumbago ..... ₱ lb 8c. net

Trowels.

Lothrops' Brick and Plastering.....dis 25
Reed's Brick and Plastering..... dis 25
Disston's Brick and Plastering... dis2o
Brade's brick..... dis 20

Tacks, Brads, &c.

New List, September 1. 1882. & Supplement Jan-1, 1886.
American iron carpet tacks all kinds dis75@75&10
Steel carpet tacks all kinds.....75
Swedes Iron carpet tacks all kinds 75
Swedes iron tacks.....70&10
Swedes iron Upholsterers' tacks..... 70@10&75
Tinned Swedes iron tacks ..... 70@10&75
Tinned Swedes iron Upholsterers' tacks 70@10&75
American iron cut tacks .....75@75&10
Copper tacks 60
Copper finishing and trunk nails.....60
Cigar box nails ..... 60@60&5
Finishing nails. .....60&10&10
Hungarian nails and miners' tacks.....60&10&10
Gimp and lace tacks..... 70@70&5
" " tinned..... 70@70&
Trunk and clout nails ..... 60&10&5
Tinned trunk and clout nails..... 60&10&5
Basket nails.....60&10
Chair nails .....60&10
Common and patent brads ..... 60&10&10
Tinned capped trunk nails 60

Tinware.

Stamped, Japaned & Pieced, list Jan 20, 1887..... .....dis 70

Tobacco Cutters.

Enterprise Mfg. Co. (Champion).....dis 20&10@30

Traps.

Game, Newhouse.....dis 35
Victor.....60&10
Wood, mouse.....15c ₱ doz holes
Delusion, mouse.....₱ gross $18 00 dis 15

Trawl Beam Lifters.

Wollensak's Patent..... dis 50

Twine.

	BC.	P.
No. 12, Flax Twine, ¼ and ⅛lb Balls...	21½c	27c....
No. 18, " " ¼ and ⅛ "	21½c	27c....
No. 36, " " ¼ and ⅛ "	20c	25c....
2-Ply Hemp, ¼ and ⅛ lb Balls (Spring Twine)	17	
3-Ply " 1 lb Balls.....	17½c	
3-Ply " 1½ lb Balls	16c	
Cotton Wrapping, 5 Balls to lb.....	15@16c	

Vises.

Solid box.....50&10&5@60
Parker's..... discount 20@25
Prentiss..... " 20 &5@25
Stephen's..... " 25
Saw Filers, Wentworth's .....dis20&10
Saw filers, Stearn's .....33⅓&10

Washer Cutters.

Smith's Patent .....₱ doz $12 00, dis 20&10&10
Johnson's.....₱ doz $11 00, dis 33⅓
Penny's.....₱ doz Pol. $14 00; Jap'd. $16 00, dis 55
Appleton's.....₱ doz $16 00, dis 60&10
Bonney's.....dis 30&10

Well Wheels.

8 in., $2.00; 10 in., $2.50; 12 in., $3.25

Wire. New List Jan. 18. 1884

Brass and Copper..... discount 20
Bright and annealed, Nos. 0 @18 ... dis70&5@72½
" " Nos. 19 @ 26....dis 72½@75
" " Nos. 27 @ 36 dis 75@75&10
Coppered Nos. 0 to 18, market list.....dis 65&10@70
Galvanized Nos. 0 to 18 " " dis 60&7½@65
Tinned market Nos. 0 to 18..... dis 55
Cast steel ..... dis 50
Tinned Broom Wire.....dis70@72½
Annealed Fence, Nos. 8 and 9..... dis75
Annealed Grape, Nos. 10 to 14..... dis 75
Stubs Steel Wire regular.....$6 50.@lb dis30

Wrenches.

Coe's genuine, cash in 10 days..... 55 & 5
Girard Standard.....discount 70&10
Agricultural.....discount 75&10
Mechanics' .....dis 55&10 & 3
Bemis & Call's Combination.....25&10
Donohue's Engineers'.....25

TINNERS' STOCK.

Tin.

Banca..... } Market very excited and advancing, prices on application.
Straits .....
English .....
Bar .....

Spelter.

American, cash, ₱ lb.....

Charcoal Tin Plate.

IC 12x12 225 sheets.....$6 00@6 80
IX 14x20 112 sheets..... 7 50@8 25
IC 10x14 225 sheets.....₱ box 6 00@6 50
IC 20x28 112 sheets..... 1 50@14 00
IX 10x14 225 sheets .....7 50@8 25
IX 12x12 225 sheets ..... 7 75@8 25
For each additional X add $1.90@3.00

Coke Tin Plate.

	Best	Ordinary
IC 10x14 } IC 14x20 }	$5 75	

Solder.

Half and Half, in bars warranted.....20
No. 1. Refined.....17½
Bingham..... 23

Zinc.

Zinc, cask.....6¼
Zinc, open.....6¾

LEAD.

Pig.....5½
Bar. ₱ lb..... .....6¾
Pipe. ₱ lb.....6½c, net
Sheet. ₱ lb.....6 net
Chilled Shot ₱ bag 25 lbs 1 50

BABBIT METAL.

No. 4.....6½
J. D.....12
Allens.....9¾
Excelsior.....15
Crescent.....20
W. B. Genuine.....38

COPPER.

Lake Ingot..... 17
Arizona..... 14½

IRON AND STEEL.

Flat Bar

1¼ to 4 by ⅜ to 1 inch.....1 90
4¼ to 6 by ⅜ to 1 inch.....2 00
1¾ to 6 by 1½ to 1 inch.....2 30
1¼ & 1¾ by ⅜ to ¾.....2 00
1 & 1¼ by ⅜ to ¾.....2 10
⅝, ¾ and ⅞ by ⅜ to ¾.....2 30

Round and Square.

1⅜ inch.....1 90
to 2¾.....2 10
2¾ to 3¼ inches.....2 40
3¾ to 4 .....2 90
4¼ to 4¾ 3 40
4¾ to 5 .....3 60

Oval.

⅜ to 1¼ inch.....2 30
⅜ to ¾ 2 50
⅞ 2 70
1 .....3 10

Hoops.

1¼ to 4, Nos. 13 to 15.....2 70
1¼ to 2, Nos. 16 to 18.....2 80
1 and 1¼, Nos. 13 to 15.....3 00

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch.....2 10
1 to 1⅜ by ¼ and 5-16 inch.....2 20
⅜ to ⅞ by ¼ and 5-16 inch.....2 40
⅛ to ¾ by ¼ and 5-16 inch.....2 90

Half Oval and Half Round.

1¼ to 3 inch.....3 00
⅛ to 1¼ 2 60
⅛ to ¾ 3 10
1 .....3 40
1¼ 4 90

Light Band.

1¼ to 6 by ⅛ to 3-16.....2 50

Sheet Iron.

No. 22 to 24.....3 10
No. 25 to 26.....3 20
No. 27.....3 30
No. 28 .....3 50

Machinery Steel.

Ordinary sizes, ⅜ to 2 in. round.....	Crucible.	Bessemer & open-h'rth.
	4	3¼
5-16 and 2⅛ to 3 in.....	5	4¼
¼ and 3⅛ to 6 in.....	6	5¼
7-32 in.....	7	6¼
3-16 in.....	9	8¼

Square, Flat and Octagon, ⅛c. extra throughout list.
Cut to specified lengths, ⅛c. extra.

Hammer Cast Steel.

	Cts.
Crucible cast steel.....	5
Open-hearth steel.....	4

Steel.

Best Quality Refined Cast Steel—Square, Flat Octagon and Round.

	Cents.
⅝ to 2 inches, inclusive.....	9
1-16 and 2¼ to 3 inches.....	10
¼ and 3¼ to 4 inches.....	11
7-32 and 4⅛ to 5 inches.....	12
3-16 and 5⅛ to 6 "	14½
5-32 "	18½
"	25½
⅛	25½
Oil well steel forgings.....	18½

Sheet Steel.

	Crucible Best.	2d. Qual.	3d. Qual.	Bessemer & open-h'rth.
To 21 gauge,	9c.	8c.	6c.	5

1c. extra for each additional gauge. Cut to multiples or specified lengths, ⅛c. extra.

Miscellaneous Cast Steel.

Augur and augur bit 3
Axle steel for wagons..... 3
Frog points and plates 5½
Frog size bars 5
Pick, hammered..... 5
Skate Steel..... 4½
Mattock, beveled..... 3
Table cutlery..... 3½
Table Cutlery, beveled..... 4
Trap spring steel..... 6
Pike and cant hook..... 7
Coal and granite wedge 7

TRAVELER'S REGISTER.

Standard Time.

In effect September 11, 1887.

N. Y. C. & St. L. R. R. Co.—"The Nickel Plate."

EASTWARD.	ARRIVE.	DEPART
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 10 p m	.....
Local Freight	4 40 p m	5 45 a m
WESTWARD.	**ARRIVE.**	**DEPART.**
Chicago Passenger		6 30 a m
Fostoria Passenger	4 46 p m	4 51 p m
Local Freight	5 20 p m	5 50 a m

Rocky River Accommodation departs 7:40 a. m.; 1: 0 p. m.

Euclid Accommodation departs 6:24 a. m. 12:10 a. m., 5:36 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburg.

	ARRIVE.	DEPART.
New York Express	12 55 p m	7 45 a m
New York Express	6 30 p m	12 10 p m
Alliance Accommodation	9 35 a m	4 15 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	* 5 25 a m	*11 10 p m
Bedford Accommodation	3 17 p m	1 40 p m

Train leaving at 12:10 p. m. has Pullman Buffet Sleeper from Cleveland to New York, arriving in New York at 7:30 next morning.

*Daily; all other trains daily except Sunday.

Mt. Vernon & Pan Handle Route

C., A. & C. Ry. Co.	ARRIVE.	DEPART.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	6 45 a m	8 00 p m
Akron & Columbus Exp	12 55 p m	12 10 p m
Akron & Orrville Accom	9 35 a m	4 15 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily except Sunday.

New York, Pennsylvania and Ohio.

	ARRIVE.	DEPART.
N. Y. & Pitts. Express	15 58 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommodation		†6 40 a m
Pittsburgh Express	† 6 25 p m	
Youngstown Local	†8 05 a m	
Mahoning div. and Pitts Local		*11 40 a m
Mahoning Val Accom		*4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	

* Daily. † Daily except Sunday. ‡ Daily except Monday.

Lake Shore & Michigan Southern Railroad.

TRAINS GOING EAST.	Arrive from West.	Depart East.
No. 4, Fast Limited Ex	2 55 a m	*2 55 a m
No. 8, N. Y., B't'n & At. Ex	*8 30 a m	*8 55 a m
No. 26, Elyria Accom	†7 45 a m	
No. 24, Toledo & Buffalo Accom. via Sandusky	†10 05 a m	†10 15 a m
No. 24, Buffalo Accom	†10 05 a m	†10 15 a m
No. 10, N. Y. & Boston "Flyer,"		*11 35 a m
No. 12, N. Y. & Bos. Ex.	*2 20 p m	*2 45 p m
No. 2, Night Express	†9 40 p m	†10 00 p m
No 26, Conneaut Accom		†4 25 p m
TRAINS GOING WEST.	**Arrive from East.**	**Depart West.**
No. 1, Fast Limited Ex	*12 15 a m	*12 15 a m
No. 23, Cleveland Express	*2 15 a m	
No. 3, Chi. Ex. via Sand'y	15 40 a m	†5 55 a m
No. 25, Mich. Ac. via Norw'k		†5 55 a m
No. 21, Toledo Ex. via Norwalk and Sandusky	†12 50 p m	†3 20 p m
No. 5, Fast St. Louis & Chicago Ex. via Sandusky	*10 50 a m	*10 55 a m
No. 9, Chi. Pac. Ex. via Nor'k	*6 55 p m	*7 15 p m
No. 31, Elyria Accommodation, to Elyria only		†4 30 p m
No. 27, Conneaut Accom	†8 10 a m	

Sunday train for Nottingham—Depart 8:15 a. m. and 1:45 p. m.; returning, leave Nottingham at 9:50 a. m. and 3:45 p. m.

Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

A local Cleveland and New York Sleeper and dining car daily on No. 10, leaving Cleveland at 11:35 a. m., arrives Grand Central Depot, New York 7:30 a. m.

For further information as to trains and connections apply at the Union Ticket Office, corner Bank & Superior-sts., under Mercantile Bank.

M. E. GAUL, City Pass. Ag't. A. J. SMITH, Gen'l Pass. & Ticket Ag't.

Cleveland and Canton Railroad.

Arrive.—Canton, Sherrodsville and Coshocton 9 55 a.m., 7 00 p.m.

Kent —*7 50 a.m., *7 16 p.m.

Bedford—*7:50 a.m., 1:05 p.m., 7 16 p.m.

Newburgh and Miles avenue—7:10 a.m., 4:15, p.m. 5:33 p.m.

Depart—

Canton, Sher'dsville & Cosh't'n—7:00 a.m. and 3:10 p.m.

Kent—*8:38 a.m. and *8:30 p.m.

Bedford—*8:38 a.m., 4:45 p.m., 11:10 a.m., 5:45 p.m.

Newburgh and Miles Avenue—6:12 a.m., 2:00 p.m., 4:40 p.m.

Trains marked with * run daily. All others daily except Sunday.

Depot at Ontario street, opposit Huron street

Cleveland, Lorain and Wheeling.

	DEPART.	ARRIVE.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

Pittsburgh & Lake Erie Railroad.

On and after May 22 1887, passenger trains will depart from and arrive at the Pittsburgh and Lake Erie Depot at Pittsburgh, as follows, Central time:

P. & L. E. R. R. Depart for—

No. 7, Cleveland, Bradford and East..... 5 30 a.m
No. 5, Buffalo, St. Louis, Cleveland ..... 7 45 a.m
No. 53, Beaver Falls Accommodation..... 8 40 a.m
No. 1, Buffalo, New York, and all New England points..... 10 15 a.m
No. 3, Chicago, Cincinnati, St. Louis,... 1 10 p.m
No. 9, Buffalo Express..... 3 40 p.m
No. 51, Beaver Falls Accommodation..... 5 20 p.m
No. 11, Buffalo Express..... 10 30 p.m

Arrive from—

No. 50, Beaver Falls Accommodation.... 5 25 a.m
No. 8, Buffalo and Cleveland Night Exp. 7 00 a.m
No. 2, Youngstown Accommodation..... 9 20 a.m
No 52 Beaver Falls Accommodation..... 1 00 p.m
No. 12, Chicago, Cincinnati & St. Louis, 1 35p.m
No. 6, Buffalo Express..... 5 45 p.m
No. 4, Cincin., St. Louis and Cleveland, 8 05p.m
No. 10, Cleveland & Buffalo Express..... 10 00 p.m

Pittsburgh & Lake Erie trains Nos. 3, 4, 5, 8, 11 and 12 daily.

W. C. QUINCY General Manager.
R. W. JONES, Master of Transportation.
GEO. REIPERT Ticket Agent.
A. D. SMITH, Gen'l Pass. Ag't, Pittsburgh.

WHEELING & LAKE ERIE

TIME TABLE—IN EFFECT SEPT. 4, 1887.

Central Standard Time.

EASTWARD.	No. 5.	No. 7.	No. 9.*	No. 1.*
Toledo.....lv	7 45 AM	1 00 PM	4 50 PM	.....
Oak Harbor...ar	8 41	1 53	5 45	.....
Fremont.....	9 07	2 18	6 10	.....
Clyde.....	9 24	2 34	6 25	.....
Bellevue	9 40	2 48	6 40	.....
Monroeville..lv	9 58	3 05	7 01	3 10 AM
Norwalk	10 15	3 22	7 17	3 22
Wellington	11 05	4 13	8 08	4 03
Creston.....ar	11 53	5 05	8 55 PM	4 47
Orrville.....ar	12 20 PM	5 35	5 15AM	5 15*
Orrville.....lv	12 40	5 40	7 00	7 00
Massillon.....ar	1 20	6 20	7 42	7 42
Massillon.....lv	1 20	6 20	7 42	7 42
Navarre	1 35	6 35	8 00	8 00
Valley June.lv.	2 15	7 20	8 45	8 45
New Cumberl'd	2 28	7 33	9 05	9 05
Sherrodsville...	2 40	7 45	9 22	9 25
Leesville	2 48	7 53	9 40	9 40
Bowerston....ar	2 55PM	8 00PM	9 50AM	9 50AM
Canal Dover....	3 42 PM	7 30PM	.....	.....
New Comerst'n	4 28	6 30 AM	.....	.....
Cambridge.....	5 25	7 30	.....	.....
Macksburg	6 56	9 03	.....	.....
Marietta.....ar	8 10 PM	10 15AM	.....	.....

WESTWARD.	No. 6.	No. 8.	No. 4.	No. 2*.
Marietta lv	6 50 AM	12 15 PM	.....	.....
Macksburg	8 04	1 26	.....	.....
Cambridge.....	9 40	3 00	.....	.....
New Comerst'n	10 50	4 00	.....	.....
Canal Dover....	11 32 AM	4 40PM	.....	.....
Bowerston.....	11 25 AM	3 45PM	6 35 AM	.....
Leesville.....	11 32	3 55	6 43	.....
Sherrodsville...	11 40	4 10	6 53	.....
New Cumberl'd	11 52	4 25	7 07	.....
Valley June....	12 20 PM	5 02	7 25	.....
Navarre.....	12 50	5 35	8 00	.....
Massillon.....	1 05	5 50	8 15	.....
Orrville.....ar	1 40	6 25	8 53	.....
Orrville.....lv	1 45	6 35*	8 58	*
Creston.....lv	2 18	7 02	9 28	5 30 AM
Wellington	3 05	7 43	10 15	6 20
Norwalk.....	3 55	8 25	11 25	7 25
Monroeville....	4 07	8 35	11 37	7 35
Bellevue.....	4 23	9 15	11 55	7 51
Clyde.....	4 39	9 29	12 10 PM	8 06
Fremont.....	4 55	9 45	12 28	8 23
Oak Harbor.....	5 20	.....	12 53	8 45
Toledo.....ar	6 15 PM	10 45*	1 50 PM	9 40 AM

No. 27	No. 25	Huron Divis'n.	No. 26	No. 24
4 35 PM	9 30AM	Ar. Huron ..Lv	12 45 PM	.....
4 18	9 12	Friese Landing	1 00	.....
4 05	9 00	.....Milan	1 17	6 55
Lv 3 40	Lv 8 35	.....Norwalk....	Ar 1 40	Ar 7 15
Ar 3 0	Ar 8 35		Lv 2 10	Lv 7 30
2 40 PM	8 15AM	..Monroeville..	2 30PM	8 10AM

* Daily.

This road is now open through from Toledo to Bowerston, connecting with the Pennsylvania System for all points East.

THROUGH CAR SERVICE.

Between Toledo, Cambridge and Marietta.
" " and Bowerston.
" " and Akron, Youngstown and Pittsburgh.
" Chicago, Akron, Youngstown and Pittsburgh.

M. D. WOODFORD, Gen'l Manager. JAMES M. HALL Gen'l Pass. Agt.

Scioto Valley Railway

TIME TABLE.

In effect Aug. 8, 1886.

THE SHORT LINE TO ALL POINTS

North and South, East and Southeast, West and Northwest.

TRAINS GOING SOUTH

STATIONS.	No. 2.	No. 4.	No. 6.
Columbus.....Lv	7 00 a.m	11 25 a.m	5 30 p.m
Valley Crossing...	7 22 "	11 47 "	5 52 "
Lockbourne	7 34 "	11 58 "	6 04 "
Ashville.....	7 50 "	12 12 p.m	6 20 "
Circleville.....	81 "	12 34 "	6 42 "
Kingston.....	8 3 "	12 54 "	7 04 "
Chillicothe	9 01 "	1 35 "	7 50 "
Sharon	9 40 "	2 11 "	8 30 "
Waverly.....	9 50 "	2 20 "	8 38 "
Piketon	10 02 "	2 34 "	8 52 "
Big Run.....	10 18 "	2 50 "	9 08 "
Lucasville.....	10 36 "	3 09 "	9 25 "
Portsmouth	11 00 "	3 35 "	9 50 "
Sciotoville.....	11 16 "	3 51 "	10 06 "
Wheelersburg	11 22 "	3 57 "	10 12 "
Havernill	11 43 "	4 18 "	10 33 "
Hanging Rock.....	11 54 "	4 29 "	10 44 "
Ironton	12 04 p.m	4 39 "	10 54 "
Petersburg	12 15 "	4 50 "	11 05 "
Ashland.....Ar	12 45 p m	5 20 p.m	11 35 p.m

Trains Nos. 2 and 4 daily, except Sunday.
Train No. 6 daily.
Train No. 6 takes supper at Chillicothe.

TRAINS GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.
Ashland Lv	2 46 a.m	8 47 a.m	5 25 p.m
Petersburg	3 15 "	9 17 "	5 55 "
Ironton	3 26 "	9 28 "	6 06 "
Hanging Rock	3 36 "	9 38 "	6 16 "
Havernill.....	3 46 "	9 49 "	6 27 "
Wheelersburg	4 06 "	10 10 "	6 48 "
Sciotoville.....	4 12 "	10 16 "	6 54 "
Portsmouth.....	4 27 "	10 32 "	7 10 "
Lucasville.....	4 49 "	10 56 "	7 35 "
Big Run.....	5 40 "	11 14 "	7 52 "
Piketon.....	5 18 "	11 30 "	8 08 "
Waverly.....	5 30 "	11 43 "	8 21 "
Sharon	5 40 "	11 53 "	8 30 "
Chillicothe	6 35 "	12 55 p.m	9 20 "
Kingston	7 03 "	1 26 "	9 46 "
Circleville.....	7 20 "	1 48 "	10 07 "
Ashville.....	7 50 "	2 10 "	10 29 "
Lockbourne	8 05 "	2 26 "	10 43 "
Valley Crossing...	8 18 "	2 38 "	10 55 "
Columbus.....Ar	8 40 a.m	3 00 p.m	11 17 p.m

Train No. 1 daily.
Trains Nos. 3 and 5 daily, except Sunday.

COUPON TICKETS, by the best routes and to all principal points in the United States and Canada, can be found at the following Stations: Columbus, Circleville, Kingston, Chillicothe Waverly, Portsmouth, Ironton, A. C. & I. Ashland.

For further information relative to rates, connections and through time, call on your Ticket Agent, or address J. ROBINSON, Receiver.
JNO. J. ANTCHER, Gen'l Pass. & Ticket Ag't, Columbus, Ohio.

Ft. Wayne, Cincinnati & Louisville RAILROAD.

THE POPULAR ROUTE

BETWEEN THE

NORTH and SOUTH

THE DIRECT ROUTE TO OR FROM
FORT WAYNE,
INDIANAPOLIS,
TERRE HAUTE,
EVANSVILLE,
AND ST. LOUIS.

13 MILES SHORTER 13
—BETWEEN—
Fort Wayne and Indianapolis
Than any other Route.

22 MILES SHORTER AND QUICKER 22
By 3 HOURS, Between
Louisville and Fort Wayne.

No change of Cars
—BETWEEN—
Cincinnati and Fort Wayne,
Via White Water Railroad.

All trains arrive and depart from Central Union Passenger Station Cincinnati, Corner Third Street and Central Avenue.

DIRECT CONNECTION

At Fort Wayne with L. S. & M. S. Trains for all points North and East.

Ask for Tickets
—VIA—
Ft. Wayne, Cincinnati & Louisville Railroad.

For sale by all Agents of connecting lines, EAST, WEST, NORTH AND SOUTH.

W. W. WORTHINGTON, Gen'l Supt. ROBT. F. KINNAIRD, Gen'l Ticket Agent, FORT WAYNE, IND.

The Picturesque Lehigh Valley Route.

Three through trains with Pullman cars attached are now run via by this beautiful scenic route, between Suspension Bridge, Buffalo, New York and Philadelphia, leaving Suspension Bridge 8:18 A. M. 4:10 and 7:45 P. M., Buffalo 9:00 A. M. and 4:40 and 10:00 P. M., connecting with all trains from the West.

Passengers between the East and West passing over the famed LEHIGH VALLEY ROAD will experience the pleasure of a trip through the most magnificent and picturesque scenery in the world, presenting an ever varying panorama of delightful surprises.

Double track, steel rails, magnificent road bed and unrivaled equipment, all combine to make the LEHIGH VALLEY the favorite and most desirable route between the East and the West.

Anthracite Coal is used entirely, guaranteeing passengers perfect freedom from the dense volumes of smoke that so greatly annoy passengers on lines using Bituminous Coal.

E. B. BYINGTON, Gen'l Pass. Agent, Mauch Chunk, Pa

For Full Description of the

BEST BOILER FURNACE

IN THE WORLD.

Send for our Pamphlet.

Brightman Stoker Co.,

72 CLEVELAND, OHIO.

NON CORROSIVE PRIMING

AND FINISHING PAINT

For Engines, Machinery, &c.

This paint being entirely free from acid, will not corrode or rust the iron.

PATENT IRON FILLING.

A composition of filling for Tools, Machinery, Engines, Locomotives, Tenders, Iron Ships, and all iron work for buildings inside or out. Send for sample card, price list and testimonials. FELTON RAU & SIBLEY, 136, 138 and 140 N. 4th-st. Philadelphia. 92-1y

New York, Penn. and Ohio Railroad

N. Y., L. E. & W. R. R. CO. LESSEES.

New York, Boston and the East.

THE SHORTEST AND QUICKEST ROUTE TO PITTSBURGH, WASHINGTON AND BALTIMORE, AND THE SOUTHEAST.

Change of time goes into effect Nov. 27, 1887.

Central, or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.

Until further notice trains will leave from the New Central Depot, South Water Street and Viaduct, as follows:

	Depart.
No. 62, Mahoning Valley Accommo	† 6 40 a m
No. 72, New York Express	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast New York Express	* 3 00 p m
No. 64, Pittsburgh Express	* 3 00 p m
No. 66, Mahoning Valley Accommo	* 5 00 p m
No. 66, Pittsburgh Local	† 5 00 p m
No. 68, Pittsburgh Express	†11 10 p m
No. 68, New York Express	†11 10 p m
No. 70, Pittsburgh Local Express	*11 40 a m
No. 74, Shenango Valley Express	† 4 00 p m

	Arrive.
No. 73, Shenango Valley Express	† 9 20 a m
No. 61, New York Express	† 5 45 a m
No. 61, Pittsburgh Express	† 5 45 a m
No. 65, Fast New York Express	*10 50 a m
No. 65, Pittsburgh Express	*10 50 a m
No. 67, Pittsburgh Express	† 1 20 p m
No. 63, New York Express	* 9 05 p m
No. 69, Pittsburgh Express	* 6 50 p m
No. 77, Youngstown Local	* 8 00 a m
No. 13, Erie Express, carrying express matter only, from all points East and South-east, carries no passengers (except Monday)	† 1 20 p m

* Daily. † Daily, except Sunday.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City and intermediate points without change. One change to Boston and New England cities.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland. Ship by Erie Express. R. H. Soule, Gen. Manager. New York City.

L. P. FARMER, Gen'l Pass. Agent, New York.

M. L. FOUTS, Passenger Agent, 141 Superior Street, Weddell House, Cleveland, O.

Cleveland & Marietta R. R.

THROUGH LINE BETWEEN

Marietta, Caldwell, Cambridge, Newcomerstown, Canal Dover, Canton, Akron, Cleveland, Buffalo, Toledo, Pittsburgh, New York, Coshocton, Newark, Zanesville, Columbus, Chicago and St. Louis.

In effect November 27th, 1887.

GOING NORTH.			GOING SOUTH.	
No. 4.	No. 2.	STATIONS.	No. 1.	No. 3.
9 35 AM	1 40 AM	..Parkersburg...	2 25 PM	11 35PM
12 10 PM	6 00	.....Marietta.....	10 25 AM	7 25
12 31	6 21	.....Caywood....	10 06	7 04
12 37	6 27	.....Stanley.....	10 00	6 58
12 52	6 42	.....Whipple.....	45	6 43
1 02	6 52	.....Warner.....	9 35	6 33
1 16	7 06	.....Elba.....	9 22	6 18
1 24	7 15	...Macksburg...	9 15	6 09
1 32	7 22	...Dexter City...	9 08	6 00
1 37	7 27	...South Olive...	9 04	5 55
1 45	7 35	.....Dudley.....	8 58	5 48
1 55	7 45	.....Caldwell.....	8 50	5 40
2 05	7 55	..Belle Valley...	8 41	5 30
2 15	8 05	..... Ava.....	8 31	5 20
2 28	8 18	...Pt. Pleasant...	8 18	5 07
2 40	8 34	.....Byesville....	8 00	4 53
3 00	8 57	...Cambridge....	7 45	4 38
3 07	9 05	.....Oldham's....	7 35	4 28
3 15	9 14	..... Miller's.....	7 28	4 20
3 25	9 25	...Kimbolton....	7 18	4 10
3 40	9 40	... Guernsey	7 03	3 55
3 47	9 47	.....Post Boy....	6 4	3 47
4 00	10 00	N. Comerstown	6 45	3 38
4 08	10 07	..... Wolf's	6 36	3 0
4 20	10 20	..Phillipsburg ..	6 25	3 18
4 24	10 25	..Back Band	6 20	3 13
4 30	10 32	.... Turner's	6 14	3 07
4 40	10 42	...Canal Dover..	6 05 AM	2 57
5 00	11 05	ar. Vall'y J'n. lv		2 35
5 02	1 20	lv. Val'y J'n. ar		2 25
	12 04 PM	.....Canton.....		1 30
	12 58	..... Akron.....		12 40 PM
	2 08	... Cleveland.....		11 30
	8 00	.....Buffalo		5 40
10 45	6 15	.....Toledo.....		7 45 AM

Through coaches on trains Nos. 2 and 3 between Marietta, Canton, Akron, Cleveland and Toledo. Close connections made at Marietta with C., W. & B., M. V. & N. and Ohio River Packet; at Cambridge with B. & O., east and west; at Newcomers own with P., C. & St. L., east and West; at Canal Dover with C., L. & W. and C. & P., north and east; at Valley Junction with W. & L. E. and Valley R'y. Train No. 8 leaves Marietta at 3 p. m., Whipple 3 55 Warner 4 10, Elba 4 30, Macksburg 4 43 Dexter City 4 55, Caldwell 5 30, arriving Cambridge 7 15 p. m. No. 5 leaves Valley Junction at 5 40 p. m., arrives at Canal Dover 6 05 p. m.

A. T. WICKOFF, Gen. Manager. W. K. RICHARDS, Gen. Pass. Agt.

Roller	5¼
Spindle, subject to machinery classification.	5½
Trap spring steel	6
Forged crank pins and lathe spindles	7¼
Piston rods, plain	4
Piston rods, forged to shapes	7¼
Slide bars, plain	5
Slide bars, forged to shapes	7½

Open Hearth or Bessemer.

Boiler fire-box and flue sheets not less than 3-16 thick	4c
Boiler, fire-box and flue sheets, not less than ¼ thick	5c
Circulars and semi-circulars, when ordered separately	6c
Smoke stack, to shape	5c
Locomotive tank steel	4c

File Cast Steel.

Square, round, half round and flat bastard, 8-inch and over	
Mill saw, 8-inch and over	5c
Taper, 3¼ inch and over	6c
Horse and shoe rasp	5c

Spring Cast Steel.

Spiral, taper, cut to lengths	4c
	5¼c

Tire Cast Steel.

1x¼ and over	6½c
1x3-16 ⅝x3-16 and ¼	7c
1 and 13-16x¼ and 5-32, ¾x3-16 and 5-32	9c
⅝ and ⅝x⅛ and 3-32 and 12g	10c
Solid safe cast steel	4c
Three and five div cast steel	5c

Agricultural Implement Cast Steel.

Fork and rake, crucible	4¼
Horse rake steel, cut to lengths, crucible	5
Hoe, crucible	5
Corn stalk cutter, beveled	4¼
Beveled hoe and shovel steel, in bars	4¼
Crucible plow steel, in slabs	4½

Bessemer and Open-hearth, rates

Spring	3¼c
Spring spiral and taper, cut to lengths	3¼
Tire, 2-16 thick and above	2¼c
Toe calk	3 c
Plow	2½c
Axle billets	2 c
Sleigh shoes	2½c
Cutter shoe, cut to length and tapered	3c
Scythe back steel	3¼c
Grain drill bars	2¼c
Grain drill points	3½c
Rolling coulter blanks, cut and punched	6c
Thresher Teeth	3¼
Rolled hammer billets	2¼c
Thresher steel	2½c

Terms.—Four months 3 per cent. discount for cash, if remitted within days

English Steel.

Jessops	16c
Round machinery	10c
Circular Saw Plates	14c
Swaged, cast	16c
Best double shear	15c
Blister, 1st quality	14c
German steel, best	10c
2d quality	9c
3rd quality	8c
Sheet cast steel, 1st quality	15¼

Boiler Rivets.

¼, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ¼, ⅜, 11-16 and ¾ inch diam	4 00

Rolls and Castings.

Furnace floor and straightening plates	1¼c
Housings and castings not otherwise specified	1¾c
Guide plates	2½c
Spindles and coupling boxes	1¾c
Sand rolls and pinions, large size	2 c
Sand rolls and pinions, small size	2½c
Pipe mill castings	3 c
Rolling mill castings under 50lb	2 c
Spur and bevel wheels, large	3 c
Spur and bevel wheels, small	3½c
Pulleys up to 30 inches	4 c
Pulleys over 30 inches	3½c
Engine castings, light	3½c
Engine castings, heavy	2½c

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

	Inside Diameter. Inches.	Weight Per Foot.	Price Per Foot Black.	Price Per Foot Galvan'd	Thickness. Inches.
Butt-Welded.	⅛	24	0 04	0 05	.068
	¼	42	0 04	0 05	.088
	⅜	56	0 04	0 05½	.091
	½	84	0 05	0 07	.109
	¾	1 12	0 07	0 09	.113
	1	1 67	0 09½	0 12½	.134
	1¼	2 24	0 12½	0 17	.140
Lap Welded.	1½	2 68	0 22	0 25	.145
	2	3 61	0 28	0 32	.154
	2½	5 74	0 44	0 49	.204
	3	7 54	0 58	0 64	.217
	3½	9 00	0 70	0 86	.226
	4	10 66	0 85	1 00	.237
	4½	12 24	1 00	1 25	.246
	5	14 50	1 20	1 50	.259
	6	18 76	1 65	2 00	.280
	7	23 27	2 00		.301
	8	28 18	2 75		.322
	9	33 70	3 70		.344
	10	40 06	4 75		.366
	11	45 02	5 75		.375
	12	49 00	6 50		.375
	13	54 00	7 75		.375
	14	58 00	9 00		.375
	15	.....	10 00		.375

Discount, (car load lots) butt-welded ⅛ inches to 1¼ inches plain	45 per cent
Ditto galvanized	35 per cent
Discounts (car load lots) lap-welded 1¼ inches to 15 inches plain	55 per cent
Ditto galvanized	42½ per cent
Discounts on less than car lots 2½ per cent. less.	
Discounts on pipe cut to specified lengths depends on size and waste, ordinarily 5 per cent lower than random.	

Line Pipe.
List March 9th, 1887. net.

Size In.	2½	3	4	4½	6	7	8	9	10	12
Price per ft	17c	20	27	30	40	53	68	74	97	1 35	1 77	2 25	3 10

Plumbers,' Steam and Gas Fitters' Supplies.

Grey Iron Fittings	discount 70
Steam Brass Goods	discount 65
Water Brass Goods	discount 60
Galvin Gate Valves	discount 40
Register Gauge Cocks	net 50
Steam Gauges	discount 40
Steam Gauges 5 inches net dial per doz	24 00
Scotch Glass Tubes	discount 75
Tools	Special
Soil Pipe & Fittings, Mott's List	discount 55

Boiler Tubes.

Discount	62½ per cent

SCRAP IRON AND OLD METAL

	Net Ton.
No. 1 R. R. wrought scrap	$22 00
No. 1 wrought scrap	20 00
No. 1 Machine cast scrap	15 00
Stove plate (free from burnt iron)	10 50
Grate bars	11 00
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	28 00
Light sheet iron	10 00
Axle turnings	16 00
Wrought turning (free from cast)	15 00
Wrought iron, oily drillings	14 00
Cast borings	11 00
Malleable iron	10 50
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails	gross tons $27 00
Old steel rails	23 00
Car wheels	20 00
Old copper	per lb 7
No. 1. H. red Brass	8¼
Heavy yellow brass	6½
Light yellow Brass	6
Scrap Zinc	3
Tea Lead	3
Heavy Lead	3¼

COAL.

WHOLESALE.

Wholesale f. o. b. cars at Cleveland:

Carbon Hill and Monday Creek	$2 10@2 25
Massillon	2 50@2 65
Palmyra, lump	2 95@3 10
Brier Hill	2 75@3 00
Pittsburgh	2 25@2 50
Salineville	2 00@2 25
Tuscarawas	2 00@2 25
New Hazelton	2 00
New Hazelton, mix	1 15@1 20
" " nut	1 75@1 85
Connotton	2 00@2 25
Connotton, mix	1 20
" nut	1 75@1 85
Anthracite grate	5 04
Anthracite egg	5 04
Anthracite stove	5 27
Anthracite chestnut	5 27

RETAIL.—Delivered.

Massillon Lump	3 65
" Nut	3 40
Carbon Hill and Monday Creek, lump	3 50
Carbon Hill and Monday Creek, nut	3 25
Straitsville, lump	3 40
Straitsville, nut	3 15
Palmyra Lump	3 75@4 00
New Haselton Lump	2 75
New Hazelton Nut	2 50
Osnaburg Lump	2 75
Osnaburg Nut	2 50
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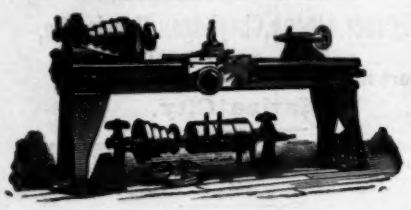

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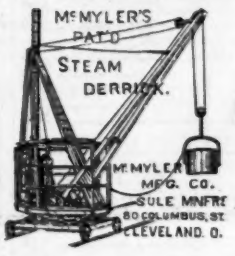

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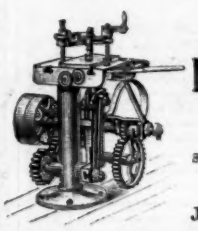

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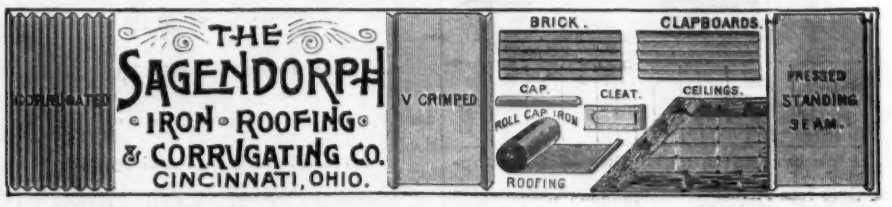
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